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An Updated Land Cover Map and Descriptions of Vegetative Communities for Los Alamos National Laboratory and Surrounding Areas

Los Alamos
NATIONAL LABORATORY
EST. 1943

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Los Alamos Field Office

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INTRODUCTION

A land cover map shows the location of different vegetative communities (for example, forests, woodlands, or grasslands) and other land cover types (for example, developed areas and water) across a landscape. Land cover maps can be used to develop information useful for managing the land: for example, estimating the amount of forest wildfire fuels, modelling the growth and movement of wildfires, identifying wildlife habitat, modelling the risk of flash flooding, documenting changes in vegetative communities over time, and evaluating the environmental impacts of proposed projects. Since vegetative communities and other land cover types change over time in response to environmental conditions and human activity, land cover maps must be periodically updated.

Prior to our effort, the most recent land cover map for Los Alamos National Laboratory was published in 2003, based on satellite imagery acquired in 2001 (McKown et al. 2003). Our map is based on satellite imagery from 2014. Between 2001 and 2014, the Los Alamos region experienced drought, bark beetle outbreaks, widespread tree mortality, and a severe wildfire. These disturbances caused substantial changes in local vegetative communities over a relatively short period of time.

STUDY AREA

The area we mapped is located primarily in Los Alamos County, in northcentral New Mexico, United States (Figure 1). The map extends from just south of Frijoles Canyon, west to the rim of the Sierra de los Valles, north past Garcia Canyon, and east to the east bank of the Rio Grande (Figure 2). This area was selected to include the entirety of the watersheds that cross the current boundaries of Los Alamos National Laboratory property, and also areas where Laboratory activities or Department of War activities occurred in the past, starting during World War II. The mapped area includes properties owned and managed by the Department of Energy, the National Park Service, the United States Forest Service, private landowners, the County of Los Alamos, the Pueblo de San Ildefonso, and Santa Clara Pueblo.

MAPPING OBJECTIVES

Before starting the mapping effort, we identified the following desired characteristics for the map:

- Minimum mapping unit: 0.1 hectares
- Desired final accuracy: 75 percent
- Number of land cover classes: approximately 24 (based on previous land cover map of the area)

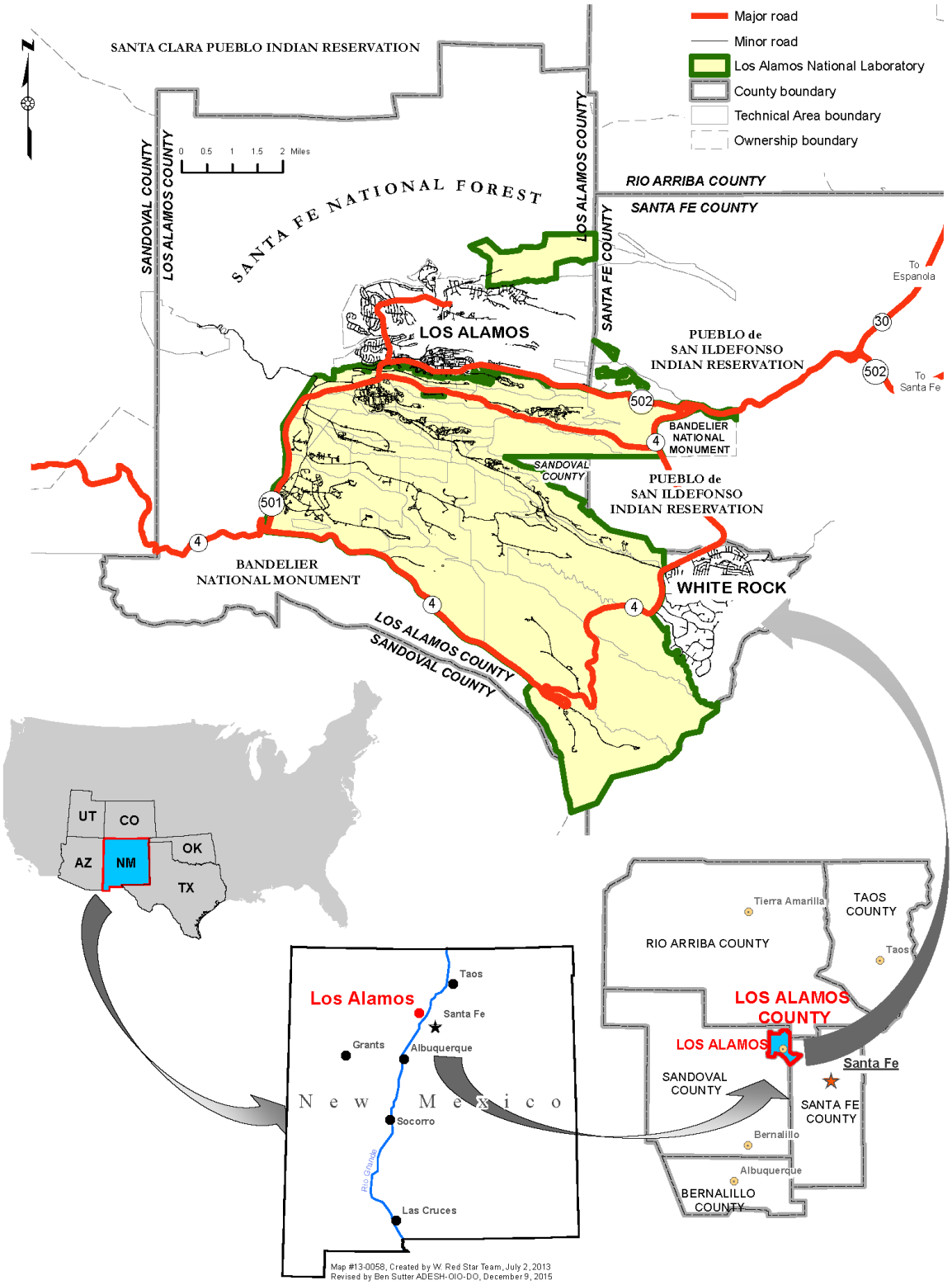

Figure 1. Location of Los Alamos National Laboratory

Figure 2. Extent of area mapped for land cover

METHODS

Satellite Imagery

We used a satellite image taken by the WorldView-2 satellite on August 14, 2014, as the basis for the map (Figure 3). WorldView-2 images have eight multispectral bands. The ground sample distance (distance between pixel centers) is 2 meters for the spectral bands and 0.5 meters for the panchromatic band.

Figure 3. Portion of the WorldView-2 Satellite image from August 14, 2014. The area shown includes the intersection of Pajarito Road and State Route 4, near White Rock, New Mexico.

Aerial Photography

During the fall of 2014, the Laboratory acquired high-resolution digital aerial photos of the Laboratory property and surrounding areas, including oblique angle photos. These photos were acquired on several different days and flights. The resolution (pixel size) of the photos was 3 inches. We did not use these photos directly to produce the land cover map. However, we did use the photos (Figure 4) to select ground-truth plot locations, to estimate percent tree and shrub cover on plots, and to select the location of training polygons.

Figure 4. Portion of the digital aerial photography from fall 2014. The area shown includes the intersection of Pajarito Road and State Route 4, near White Rock, New Mexico.

Land Cover Classes

We began our project with the land cover classes used for the land cover map published in 2003 (McKown et al. 2003). The land cover classes used for that map were:

- *Abies concolor* (white fir) – *Pseudotsuga menziesii* (Douglas-fir) Forest
- *Abies concolor – Pseudotsuga menziesii* Woodland
- *Abies lasiocarpa* (subalpine fir) – *Picea engelmannii* (Engelmann spruce) Forest
- *Bromus carinatus* (California brome) – *Agropyron trachycaulum* (slender wheat grass) Grassland
- Forest or Shrub dominated riparian or wetland communities
- *Juniperus monosperma* (oneseed juniper) Wooded Grassland
- Mixed needle-leaved evergreen – *Populus tremuloides* (quaking aspen) Forest
- Montane Grassland
- Other Shrubland
- *Pinus edulis* (piñon pine) – *Juniperus monosperma / Artemisia tridentata* (big sagebrush) Woodland
- *Pinus edulis – Juniperus monosperma / Bouteloua gracilis* (blue grama) Woodland
- *Pinus edulis – Juniperus monosperma / Bouteloua gracilis* Wooded Grassland
- *Pinus edulis – Juniperus monosperma* / Sparsely vegetated – Bare soil Woodland
- *Pinus edulis – Juniperus monosperma* / Sparsely vegetated – Bare rock Woodland
- *Pinus edulis* Forest
- *Pinus ponderosa* (ponderosa pine) Forest
- *Pinus ponderosa* / *Bouteloua gracilis – Schizachyrium scoparium* (little bluestem) Woodland
- *Pinus ponderosa* / *Bouteloua gracilis* Woodland
- *Pinus ponderosa* / Other Grass Woodland
- *Pinus ponderosa* / *Quercus gambelii* (Gambel oak) Woodland
- *Populus tremuloides* (Aspen) Forest
- *Populus tremuloides* Shrubland
- *Quercus gambelii* Shrubland
- *Robinia neomexicana* (New Mexico locust) Shrubland
- Sparsely vegetated or unvegetated bare rock
- Sparsely vegetated or unvegetated bare soil
- Submontane Grassland
- Urban, Paved
- Urban, Vegetated
- Valles Caldera Grassland

These vegetative community names came from the version of National Vegetation Classification System published in 1997 (FGDC 1997). In that version, forests were defined as having 60 to 100 percent tree canopy cover, woodlands as 25 to 60 percent tree canopy cover, shrublands as being dominated by shrubs and having greater than 25 percent shrub canopy cover, and grasslands as being dominated by grasses and having greater than 25 grass cover. Associations were often defined using both the dominant overstory species and dominant understory species. The National Vegetation Classification is periodically revised based on newly available information and updated data standards (USNVC 2016). The current classification does not have a specific canopy cover percentage that separates forest from woodlands.

For the purposes of our land cover map, we defined vegetation types dominated by trees as forests if they had greater than 50 percent canopy cover, and as woodlands if they had 10 to 49 percent canopy cover. Vegetation types were classified as shrublands if they had at least 10 percent shrub cover and few to no trees. We also separated dense woodlands from sparse woodlands, and dense shrublands from sparse shrublands. Dense woodlands had at least 30 percent canopy cover of the dominant trees, and dense shrublands had at least 30 percent canopy cover of shrubs. We did not use understory plant species in assigning our vegetation community names.

The map published in 2003 covered a much greater area than our mapping effort (1,821 square kilometers versus 457 square kilometers). Some vegetation communities identified in the 2003 map did not occur in our mapping area. Many areas that were severely burned during the Cerro Grande wildfire in 2000 and the Las Conchas wildfire in 2011 have regrown into oak or New Mexico locust shrublands, or are regenerating into early successional quaking aspen stands.

One of the other big changes in vegetation communities between the map produced in 2003 and our current map is the disappearance of mature piñon pine trees as a dominant element in local woodland tree communities. A high percentage of local mature piñon trees were killed by a bark beetle outbreak between 2001 and 2005 (Breshears et al. 2005, Williams et al. 2010). Because most of the mature piñon are gone, we did not have piñon-juniper woodland types. We added some juniper woodland types.

The final land cover classes used for this map are:

- Aspen – mixed conifer forest or woodland
- Aspen forest
- Aspen regeneration
- Asphalt road
- Blue grama grassland
- Dense juniper woodland
- Dense oak shrubland
- Developed
- Forested riparian
- Golf course
- Las Conchas recovering grassland
- Mixed conifer
- Mixed species shrubland
- Montane grassland
- New Mexico locust shrubland
- Nonforested wetland/riparian
- Ponderosa pine forest
- Ponderosa pine regeneration

- Ponderosa pine woodland
- Semievergreen shrubland
- Sparse juniper woodland
- Sparse oak shrubland
- Sparsely vegetated – bare rock
- Sparsely vegetated – bare soil
- Submontane grassland
- Water

Ground-Truth Plots

During January through August of 2015, we collected vegetation data and took photos at 242 plots to ground-truth our map. The plot locations were selected using the 2014 digital aerial photography, and the vegetative community was verified during the field visit. Most ground-truth plots were circular and approximately 0.5 hectares in size. At each ground-truth plot, we recorded the dominant tree and shrub species and visually estimated their percent canopy cover. We also visually estimated the percent of ground cover in the following categories: grass, total vegetation, litter, bare soil, rocks, and downed wood (see Appendix 1 for data sheet).

We planned to visit 10 plots for each of the vegetation communities on our original list. However, as we conducted fieldwork, we found that some vegetation communities were rare or difficult to access. We also identified several new land cover classes, and did not use some other land cover classes from the draft list because of the substantial ecological disturbances. We needed additional plots in some vegetation communities to assist with the supervised classification of the satellite image. We therefore ended up with an uneven distribution of ground-truth plots among our final land cover classes (Table 1).

Table 1. Number of Ground-truth Plots per Vegetation Community

Vegetation Type	Number of Ground-Truth Plots
Aspen - mixed conifer forest or woodland	7
Aspen regeneration	5
Blue grama grassland	10
Dense juniper woodland	30
Dense oak shrubland	17
Developed	16
Forested riparian	10
Las Conchas recovering grassland	1
Mixed conifer	19
Montane grassland	2
New Mexico locust shrubland	10
Nonforested wetland/riparian	15
Ponderosa pine forest	1
Ponderosa pine regeneration	10
Ponderosa pine woodland	17
Semievergreen shrubland	23
Sparse juniper woodland	26
Sparse oak shrubland	9

Vegetation Type	Number of Ground-Truth Plots
Sparsely vegetated - bare rock	4
Sparsely vegetated - bare soil	4
Submontane grassland	6
Total	242

Training Polygons

As we conducted the supervised classification of the satellite image to produce the land cover map, we found that we needed training areas that were larger than the areas of the ground-truth plots. We therefore digitally delineated training polygons using the 2014 aerial photography as displayed in ArcGIS and information from ground-truth plots to identify boundaries of larger representative areas for the individual land cover classes. Not all ground-truth plot locations were used as part of training polygons. Training polygons ranged from less than 1 hectare (for sparsely vegetated bare rock and bare soil and for asphalt road) to 42.5 hectares in size. The number of training polygons and the total sum of their areas are shown in Table 2 by land cover class.

Table 2. Number of Training Polygons and Total Area per Land Cover Class

Land Cover Class	Number of Training Polygons	Sum of Area of Training Polygons (hectares)
Aspen - mixed conifer forest or woodland	20	57.21
Aspen forest	1	4.58
Aspen regeneration	20	35.9
Asphalt road	42	12.21
Blue grama grassland	17	25.47
Dense oak shrubland	28	36.71
Flat dense juniper woodland	23	88.05
Forested riparian	12	23.21
Golf course	7	6.77
Las Conchas recovering grassland	7	15.17
Mixed conifer forest	13	33.02
Mixed conifer woodland	22	142.42
Mixed species shrubland	9	11.42
Montane grassland	19	30.56
New Mexico Locust shrubland	13	30.87
New Mexico Locust shrubland with snags	9	19.37
Nonforested wetland/riparian	10	13.42
Ponderosa pine forest	19	56.39
Ponderosa pine regeneration	12	35.23
Ponderosa pine woodland	27	299.09
Semievergreen shrubland	25	33.33
Sparse juniper woodland	33	257.34

Land Cover Class	Number of Training Polygons	Sum of Area of Training Polygons (hectares)
Sparse oak shrubland	16	76.49
Sparsely vegetated - bare rock	27	10.53
Sparsely vegetated - bare soil	63	6.45
Steep dense juniper woodland	18	80.36
Submontane grassland	16	20.96
Water	27	29.7

Image Processing and Analysis

Following ortho-rectification of the satellite imagery, we used ENVI software, produced by Harris Geospatial, to conduct unsupervised and supervised classification of the satellite image. The software was run on a Windows XP computer system.

The satellite image was sharpened and contrast adjusted. Following these adjustments, a supervised classification process was conducted using a maximum likelihood method that calculates the probability that a given pixel belongs to a specific land cover class. The training polygons were used to "train" the classification algorithm, and then the algorithm was applied to classify the entire area. These classification results were smoothed by merging small polygons into larger ones. Several supervised classifications were conducted iteratively. Each supervised classification was evaluated for producer's and user's accuracy, and best judgment was used to combine or separate land cover classes and provide additional training polygons until the overall classification accuracy was acceptable for proceeding with the map. Flat dense juniper woodland was combined with steep dense juniper woodland, mixed conifer forest was combined with mixed conifer woodland, and New Mexico locust shrubland was combined with New Mexico locust shrubland with snags in the final map.

Following the automated supervised classification using ENVI software, the draft raster map was imported into ArcGIS for further processing. We overlaid the draft map on the 2014 aerial photography and manually corrected some larger misclassified areas. Finally, we used ArcGIS Generalization tools to smooth the classified image. The Majority Filter, Boundary Clean, Region Group, Extract by Attributes, and Nibble tools were used.

To remove single, misclassified raster cells in the map, the Majority Filter tool was applied. This tool replaced individual cells based on the majority of their contiguous neighboring cells. To smooth the boundaries between zones, the Boundary Clean tool was applied. The Majority Filter and Boundary Clean tools processed misclassified cells (single cells or very small clusters) by assigning them to the value that appeared most frequently in the immediate neighborhood.

Several individual groupings of like cells were considered too small to be meaningful for this map. These clusters were dissolved into the surrounding groups using the Region Group tool. This tool assigned a unique identifier to each region in the input raster map. Next, using the Extract by Attributes tool, an output raster map was created where regions smaller than 625 cells (i.e., the minimum mapping unit) were removed. Finally, using the Nibble tool, the removed raster cells were replaced in the output raster with the values of their nearest neighbors.

RESULTS

Figure 5 shows the final results of data and image processing.

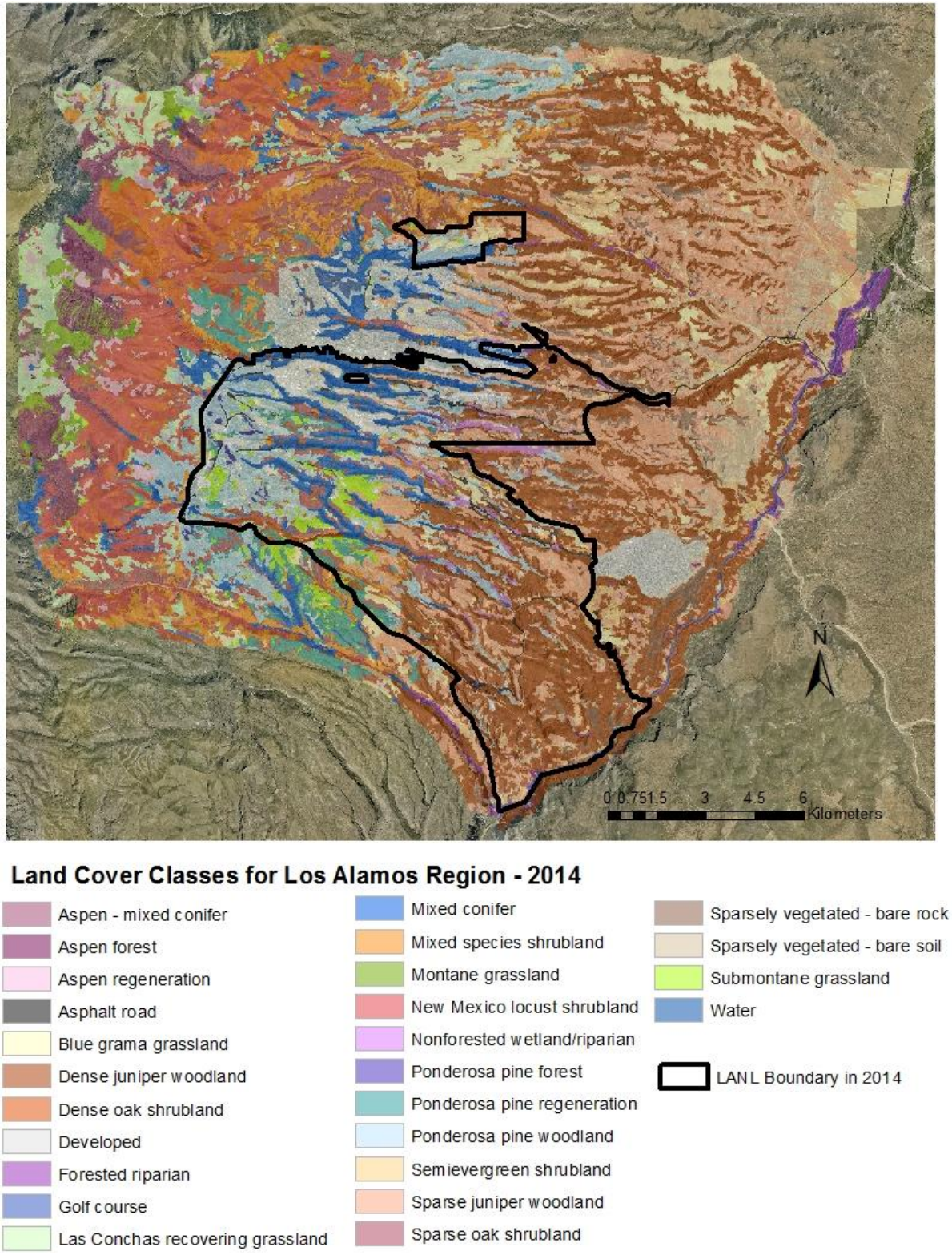

Figure 5. Los Alamos region land cover map

Accuracy Assessment

When we compared the areas within the training polygons to their land cover classification in the final map, 80.52 percent of the areas within the training polygons were correctly classified (Table 3). The developed land cover class was not included in this assessment as all developed areas were digitally delineated by us rather than identified as part of the image classification process.

Table 3. Percent of Training Polygons Correctly Classified in the Final Land Cover Map by Land Cover Class

Class Name	Percent Area of Training Polygon Correctly Classified
Aspen - mixed conifer forest or woodland	84.47%
Aspen forest	99.91%
Aspen regeneration	51.79%
Asphalt road	81.85%
Blue grama grassland	81.84%
Dense juniper Woodland	86.77%
Dense oak shrubland	79.51%
Forested riparian	98.75%
Golf course	100.00%
Las Conchas recovering grassland	91.57%
Mixed conifer	67.79%
Mixed species shrubland	91.92%
Montane grassland	90.32%
New Mexico Locust shrubland	94.78%
Nonforested wetland/riparian	76.51%
Ponderosa pine forest	100.00%
Ponderosa pine regeneration	86.54%
Ponderosa pine woodland	78.20%
Semievergreen shrubland	72.67%
Sparse juniper woodland	76.04%
Sparse oak shrubland	87.48%
Sparsely vegetated - bare rock	93.02%
Sparsely vegetated - bare soil	62.49%
Submontane grassland	71.57%
Water	97.61%
All classes combined	80.52%

We used the ground-truth plots to do additional assessments of the accuracy of the land cover map (Figure 6). We developed confusion matrices, which show how areas of known land cover type from the ground-truth plots were classified in the map. We calculated user's and producer's accuracy for plots that did not overlap the training polygons (Table 4) and for the plots that did overlap the training polygons (Table 5). Only the land cover types that were included in the ground-truth plots are included as columns in these tables, and only the land cover types that were mapped within those plot boundaries are included as rows in these tables. Therefore, not all land cover types are necessarily represented in either the rows or the columns, and the number of rows and columns are not necessarily equal.

The overall accuracy rates were 61.3 percent for the ground-truth plots not overlapping the training polygons, and 70.0 percent for the plots that did overlap the training polygons. Based on all of these assessments, we estimate the accuracy of this map to be between 60 and 80 percent.

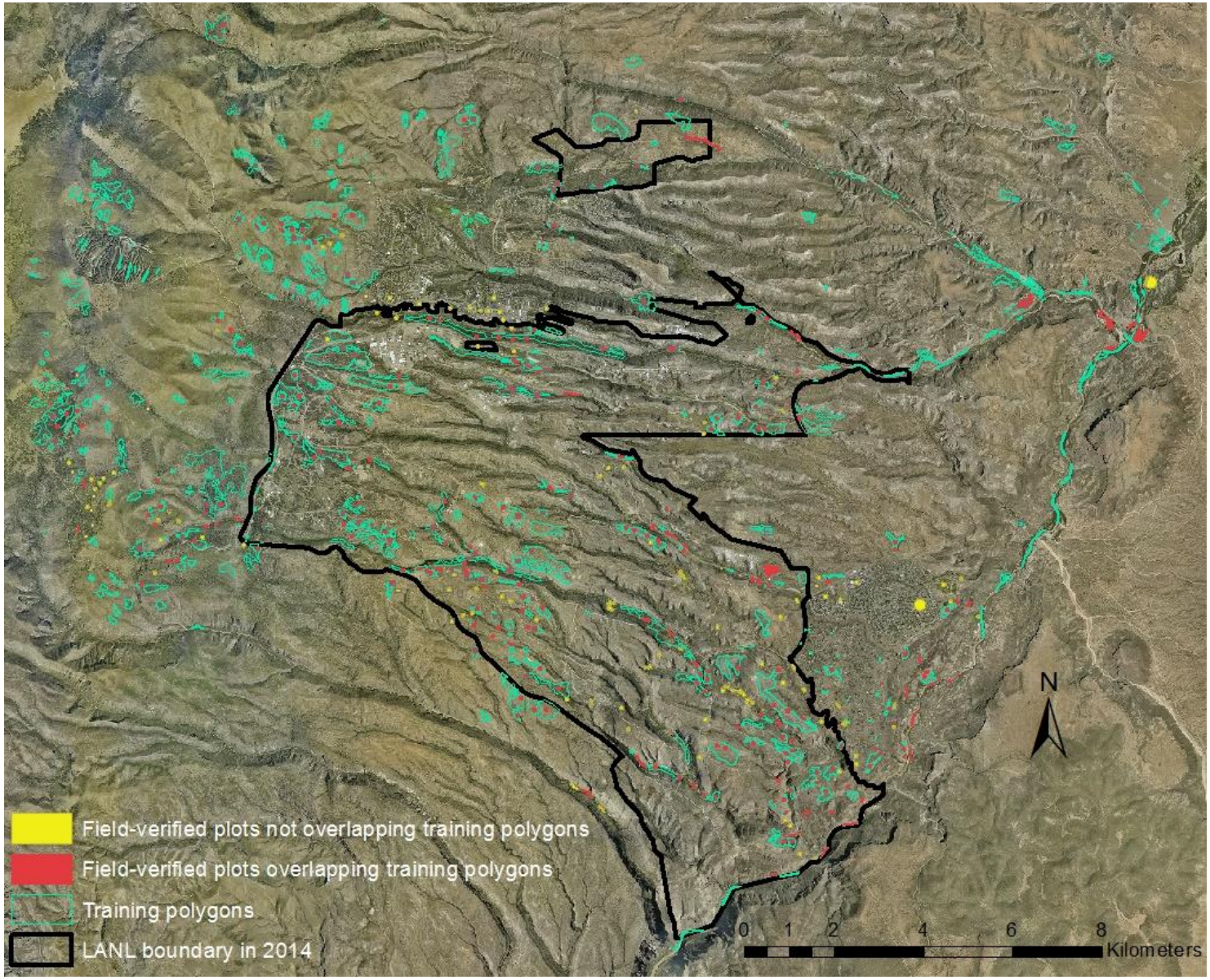

Figure 6. Location of the training polygons and field-verified ground-truth plots

Table 4. Accuracy Assessment Confusion Matrix Using Field-verified Ground-truth Plots That Did Not Overlap the Areas Selected for the Training Polygons (82 plots)*

Predicted Land Cover / Actual Land Cover	Aspen - mixed conifer	Aspen regeneration	Blue grama grassland	Dense juniper woodland	Dense oak shrubland	Developed	Forested riparian	Mixed conifer	New Mexico locust shrubland	Nonforested wetland/riparian	Ponderosa pine regeneration	Ponderosa pine woodland	Semievergreen shrubland	Sparse juniper woodland	Sparse oak shrubland	Sparsely vegetated - bare soil	Submontane grassland	Water	Grand Total (ha)	User's Accuracy (%)
Aspen - mixed conifer	1.97	0.19						2.1											4.26	46.2
Aspen regeneration		0.59																	0.59	100
Asphalt road				0.03															0.03	0
Blue grama grassland						0.21				0.07			0.56		0.47				1.31	0
Dense juniper woodland				1.18		0.01				0.74		1.04	0.84	1.09			0.01		4.91	24.0
Dense oak shrubland									0.1						0.16				0.26	0
Developed						12.51										0.02		0.37	12.9	97.0
Forested riparian				0.84			6.59						0.01						7.44	88.6
Las Conchas recovering grassland	0.03																		0.03	0
Mixed conifer	0.05						0	1.1				0.66							1.81	60.8
Mixed species shrubland					1.04						0.46		0.5		0.05				2.05	0
New Mexico locust shrubland	0.06	0							0.65			0.93			0.3		0		1.94	33.5
Nonforested wetland/riparian										1.64		0.02							1.66	98.8
Ponderosa pine regeneration					0				0.04		0.59	0.22			1.05				1.9	31.1
Ponderosa pine woodland										0.72		1.81							2.53	71.5
Semievergreen shrubland													2.2				0.5		2.7	81.5

Predicted Land Cover / Actual Land Cover	Aspen - mixed conifer	Aspen regeneration	Blue grama grassland	Dense juniper woodland	Dense oak shrubland	Developed	Forested riparian	Mixed conifer	New Mexico locust shrubland	Nonforested wetland/riparian	Ponderosa pine regeneration	Ponderosa pine woodland	Semievergreen shrubland	Sparse juniper woodland	Sparse oak shrubland	Sparsely vegetated - bare soil	Submontane grassland	Water	Grand Total (ha)	User's Accuracy (%)
Sparse juniper woodland			0.21	0.52	0.03	0.44	0.39			0.04		0.03	1.24	0.92	0.41	0.49			4.72	19.5
Sparse oak shrubland														0.13	1.15				1.28	89.8
Sparsely vegetated - bare rock													0.27						0.27	0
Sparsely vegetated - bare soil				0		0.07							0.07			0.02			0.16	12.5
Submontane grassland			0.3						0.2			0.05			0.04				0.59	0
Water																0.31			0.31	0
Grand Total	2.11	0.78	0.51	2.57	1.07	13.24	6.98	3.2	0.99	3.21	1.05	4.76	5.69	2.14	3.63	0.84	0.51	0.37	54.2	
Producer's Accuracy (%)	93.4	75.6	0	45.9	0	94.5	94.4	34.4	65.7	51.1	56.2	38.0	38.7	43.0	31.7	2.4	0	0		
Overall Accuracy (%)	61.4																			

* Values are hectares, unless indicated otherwise. Values in yellow cells are the sum of areas in which predicted and actual land cover class were the same.

Table 5. Accuracy Assessment Confusion Matrix Using Field-verified Ground-truth Plots That Overlap Areas Selected for the Training Polygons (160 plots)*

Predicted Land Cover / Actual Land Cover	Aspen - mixed conifer	Aspen regeneration	Blue grama grassland	Dense juniper woodland	Dense oak shrubland	Forested riparian	Las Conchas recovering grassland	Mixed conifer	Montane grassland	New Mexico locust shrubland	Nonforested wetland/riparian	Ponderosa pine forest	Ponderosa pine regeneration	Ponderosa pine woodland	Semievergreen shrubland	Sparse juniper woodland	Sparse oak shrubland	Sparsely vegetated - bare rock	Sparsely vegetated - bare soil	Submontane grassland	Grand Total	User's Accuracy (%)
Aspen - mixed conifer	1.59							1.48													3.07	51.8
Asphalt road											0.55	0		0.02		0.01					0.58	0
Blue grama grassland			2.18		0										0.04					0.31	2.53	86.2
Dense juniper woodland			0.1	12.73		0.02					0.64	0.08		0.78	2.27	3.35					19.97	63.7
Dense oak shrubland		0.08			2.71			0.02													2.81	96.4
Forested riparian						14.09															14.09	100
Las Conchas recovering grassland							0.24														0.24	100
Mixed conifer							0.18	5.26				0.29		0.67							6.4	82.2
Mixed species shrubland		0.16		0.04	1.83			0.01					0.95	0.01							3	0
Montane grassland									0.83												0.83	100
New Mexico locust shrubland		1.44			0.76		0.12	0.13		3.42											5.87	58.3
Nonforested wetland/riparian			0.16		0.23						4.1										4.49	91.3
Ponderosa pine forest												0.42		0.5							0.92	45.7
Ponderosa pine regeneration			0.05		1.13					0.04			2.88	0.51			0.19			0.38	5.18	55.6
Ponderosa pine woodland		0.04	0.37					0			0.19			1.43			0.01				2.04	70.1

Predicted Land Cover / Actual Land Cover	Aspen - mixed conifer	Aspen regeneration	Blue grama grassland	Dense juniper woodland	Dense oak shrubland	Forested riparian	Las Conchas recovering grassland	Mixed conifer	Montane grassland	New Mexico locust shrubland	Nonforested wetland/riparian	Ponderosa pine forest	Ponderosa pine regeneration	Ponderosa pine woodland	Semievergreen shrubland	Sparse juniper woodland	Sparse oak shrubland	Sparsely vegetated - bare rock	Sparsely vegetated - bare soil	Submontane grassland	Grand Total	User's Accuracy (%)
Semievergreen shrubland			0.38			0.01					0.01				1.83	0.07			0.06		2.36	77.5
Sparse juniper woodland			0.2	0.53	0.41	0								0.26	0.29	6.66					8.35	79.8
Sparse oak shrubland		0.17			0.79								0		0.45		0.76				2.17	35.0
Sparsely vegetated - bare rock				0.01											0.21	0.47	0.09	1.95			2.73	71.4
Sparsely vegetated - bare soil			0.1			0.15									0.5	0.95			0.05		1.75	2.9
Submontane grassland									0.26	0.84			0.35							1.75	3.2	54.7
Water						0.04															0.04	0
Grand Total	1.59	1.89	3.54	13.31	7.86	14.31	0.54	6.9	1.09	4.3	5.49	0.79	4.18	4.18	5.59	11.51	1.05	1.95	0.11	2.44	92.62	
Producer's Accuracy (%)	100	0	61.6	95.6	34.5	98.5	44.4	76.2	76.1	79.5	74.7	53.2	68.9	34.2	32.7	57.9	72.4	100	45.5	71.7		
Overall Accuracy (%)	70.0																					

* Values are in hectares, except where indicated. Values in yellow cells are the sum of areas in which predicted and actual land cover were the same.

VEGETATIVE LAND COVER CLASS DESCRIPTIONS

Here we report the narrative description, elevation range, and total area of individual vegetative land cover classes as mapped in this land cover map. Water, golf course, and developed cover types are not discussed. We also report a summary of the ground-truth data for those land cover classes with ground-truth plots. Scientific names of plant species are listed in Appendix 2.

At ground-truth plots, we identified up to three tree species (greater than 10 feet tall) if they were present, and up to three small tree or shrub species (less than 10 feet tall) if they were present, and estimated their percent absolute canopy cover using the following categories: less than 10 percent canopy cover, between 10 and 50 percent canopy cover, and greater than 50 percent canopy cover. For the ground surface, the amount of grass cover, total ground vegetation cover, litter cover, bare soil, rock cover, and downed wood was estimated using the same categories. Some plots were visible but not accessible because of topography or for other reasons. In those cases, we did not collect data for the characteristics we could not visually assess, such as shrub cover or ground surface cover.

For some plots, we also calculated the overstory canopy cover of either trees or shrubs (depending on which was the overstory canopy) using a Geographic Information System. We overlaid a grid of points on the ortho-rectified aerial photography of the plot location at a 1:500 scale. The distance between the points represented a distance of 8 meters on the ground. For most plots, this resulted in between 70 and 90 points per plot (depending on the exact size of the plot and the placement of the grid across the plot). The number of points touching a tree or shrub in the plot was divided by the total number of points in the plot to estimate the canopy cover within that plot.

In the sections below, we present the overstory and understory vegetation data for the field-verified ground-truth plots for each vegetation type. We also present the percent ground cover and estimated percent total tree or shrub cover for plots in three categories for each vegetation type: (1) plots that were field-verified as the vegetation type, and also partly or completely classified by the map as that vegetation type (correctly-classified); (2) all field-verified plots of that vegetation type, regardless of their classification in the map; and (3) all plots that were at least partly classified as that vegetation type, whether or not field verification showed the plot to be that vegetation type (all classified).

Aspen-Mixed Conifer Forest or Woodland

Figure 7 shows photos from a correctly classified plot.

Figure 7. Views of plot 203 to the a) north, b) east, c) south, and d) west from the plot center

Narrative description: These stands are a mixture of conifers and quaking aspens. Conifers may include white fir, ponderosa pine, Douglas-fir, limber pine, and southwestern white pine. Aspens are present as mature trees or regeneration, but with at least some mature trees. Canopy is open to moderately closed.

Elevation range and total area as mapped: The minimum mapped elevation of this vegetative community was 8,049 feet above sea level, and the maximum mapped elevation was 10,458 feet above sea level. The total area mapped for this vegetative community within the study area was 3,562 acres.

Ground-truth plot data: There were seven ground-truth plots in this vegetative community. All seven ground-truth plots had some area correctly classified in the map. The data for plots are presented in Tables 6 and 7.

Table 6. Estimated Percent Canopy Cover of Tree Species (>10 feet tall) and Small Tree (<10 feet tall) and Shrub Species for Seven Field-verified Aspen – Mixed Conifer Forest or Woodland Ground-truth Plots*

	Number (%) of plots with the species	Percent of plots with cover <10 percent	Percent of plots with cover between 10 and 50 percent	Percent of plots with cover >50 percent
Tree Species				
Quaking aspen	7 (100%)	57%	43%	
Douglas-fir	5 (71%)		71%	
Ponderosa pine	4 (57%)		57%	
White fir	5 (71%)	43%	29%	
Small Tree / Shrub Species				
Quaking aspen	7 (100%)	14%	43%	43%
Douglas-fir	3 (43%)	43%		
New Mexico locust	2 (29%)	14%	14%	
White fir	2 (29%)	29%		
Gooseberry sp.	1 (14%)	14%		
Fivepetal cliffbush	1 (14%)	14%		

* Only the three most abundant species were listed for trees and for small trees and shrubs in each plot. Blank spaces represent 0% cover.

Table 7. Estimated Percent Total Tree or Shrub Canopy Cover and Ground Cover for Correctly Classified and Field-verified Aspen – Mixed Conifer Forest or Woodland Ground-truth Plots, and Ground-truth Plots That Were At Least Partially Classified as Aspen – Mixed Conifer Forest or Woodland*

Plot Category Cover Category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Field-verified and correctly classified aspen – mixed conifer forest or woodland plots (n = 7)							**35.7 (11.0)** (n = 2)	**No Data**
Cover <10%	14%	0%	0%	86%	43%	14%		
Cover 10% to 50%	29%	29%	86%	14%	43%	71%		
Cover >50%	57%	71%	14%	0%	14%	14%		
All plots at least partly classified as aspen – mixed conifer forest or woodland (n = 15)							**40.8 (16.8)** (n = 5)	**No Data**
Cover <10%	13%	0%	0%	93%	33%	21%		
Cover 10% to 50%	47%	40%	73%	7%	60%	71%		
Cover >50%	40%	60%	27%	0%	7%	7%		

* All field-verified plots were partly or wholly correctly classified.

How ground-truth plots were classified: Figure 8 shows how the areas within the seven aspen – mixed conifer forest or woodland ground-truth plots were classified in the current map.

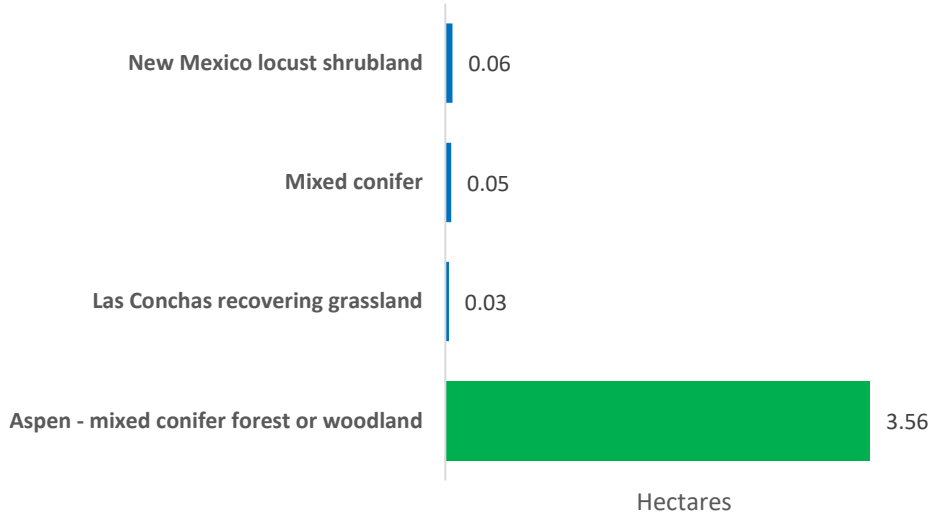

Figure 8. Map classifications of field-verified aspen – mixed conifer forest or woodland plots

Aspen Forest

Photos: There were no photos for this vegetative community.

Narrative description: The overstory canopy of this class is dominated by mature quaking aspen, with occasional small amounts of conifer species present (less than 10 percent overstory canopy cover).

Elevation range and total area as mapped: The minimum mapped elevation of this vegetative community was 9,151 feet above sea level, and the maximum mapped elevation was 10,072 feet above sea level. The total area mapped for this vegetative community within the study area was 124 acres.

Ground-truth plot data: There were no ground truth plots for this vegetative community.

How ground-truth plots were classified: There were no ground truth plots for this vegetative community.

Aspen Regeneration

Figure 9 shows photos from a correctly classified plot.

Figure 9. Views of plot 415 to the a) north, b) east, c) south, and d) west from the plot center

Narrative description: These areas are dominated by regrowth of quaking aspen colonies, generally following wildfire. Snags of mature trees may or may not be present, depending on how many recent wildfires the site has experienced. The aspens are generally less than 20 feet tall. New Mexico locust and oak species may also be present.

Elevation range and total area as mapped: The minimum mapped elevation of this vegetative community was 7,702 feet above sea level, and the maximum mapped elevation was 10,227 feet above sea level. The total area mapped for this vegetative community within the study area was 1,183 acres.

Ground-truth plot data: There were five ground-truth plots in this vegetative community, and one of those ground-truth plots was partially or wholly correctly classified in the map. Only one plot contained area that was classified as aspen regeneration in the map, and it was an aspen

regeneration plot. Therefore, the correctly-classified and all-classified aspen regeneration plots were the same. The data for plots are presented in Tables 8 and 9.

Table 8. Estimated Percent Canopy Cover of Tree Species (>10 feet tall) and Small Tree (<10 feet tall) and Shrub Species for Five Aspen Regeneration Ground-truth Plots*

	Number (%) of plots containing the species	Percent of plots with cover <10 percent	Percent of plots with cover between 10 and 50 percent	Percent of plots with cover >50 percent
Tree Species				
Quaking aspen	4 (80%)	60%	20%	
Douglas-fir	2 (40%)	40%		
Small Tree / Shrub Species				
Quaking aspen	5 (100%)		80%	20%
New Mexico locust	4 (80%)	60%	20%	
Rocky Mountain maple	1 (20%)	20%	20%	
Gambel oak	1 (20%)	20%		
Ponderosa pine	1 (20%)	20%		

* Only the three most abundant species were listed for trees and for small trees and shrubs in each plot. Blank spaces represent 0% cover.

Table 9. Estimated Percent Total Tree or Shrub Canopy Cover and Ground Cover for Correctly Classified Aspen Regeneration Ground-truth Plots, Field-verified Aspen Regeneration Ground-truth Plots, and All Ground-truth Plots That Were at Least Partially Classified as Aspen Regeneration*

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Correctly classified and all classified aspen regeneration plots (n = 1)							**No Data**	**No Data**
Cover <10%	0%	0%	0%	100%	0%	0%		
Cover 10% to 50%	100%	0%	100%	0%	100%	100%		
Cover >50%	0%	100%	0%	0%	0%	0%		
Field-verified aspen regeneration plots (n = 5)							**No Data**	**No Data**
Cover <10%	60%	0%	60%	80%	80%	40%		
Cover 10% to 50%	20%	20%	40%	20%	20%	60%		
Cover >50%	20%	80%	0%	0%	0%	0%		

* Percent tree and shrub canopy cover is calculated from point counts from aerial photos.

How ground-truth plots were classified: Figure 10 shows how the areas within the five aspen regeneration ground-truth plots were classified in the current map.

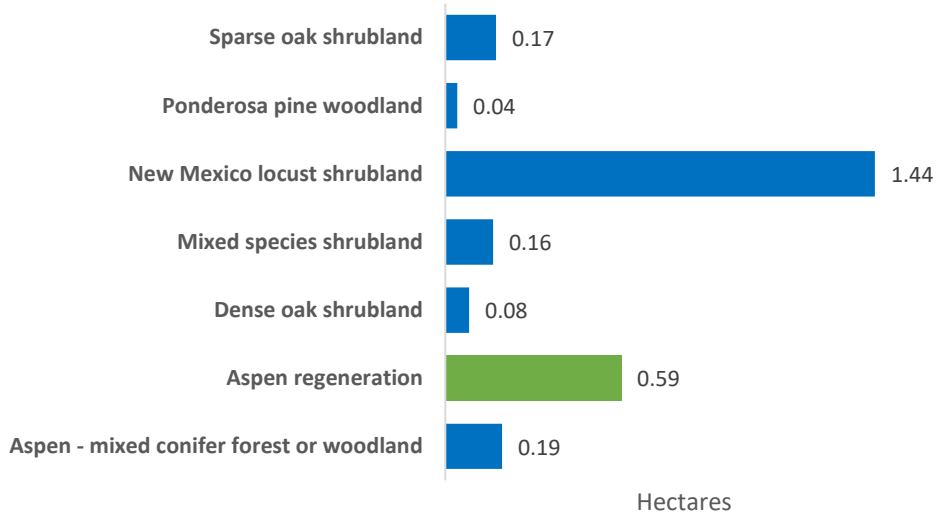

Figure 10. Map classifications of field-verified aspen regeneration ground-truth plots

Blue Grama Grassland

Figure 11 shows photos from a correctly classified plot.

Figure 11. Views of plot 79 to the a) north, b) east, c) south, and d) west from the plot center

Narrative description: These grasslands have a moderate to dense (10 to 80 percent) herbaceous layer that is dominated by blue grama. Scattered shrubs and subshrubs such as chamisa, big sagebrush, and snakeweed may be present, and scattered piñon, juniper, or ponderosa pine may be present.

Elevation range and total area as mapped: The minimum mapped elevation of this vegetative community was 6,227 feet above sea level, and the maximum mapped elevation was 9,083 feet above sea level. The total area mapped for this vegetative community within the study area was 4,576 acres.

Ground-truth plot data: There were 10 ground-truth plots in this vegetative community, and six of those ground-truth plots were partially or wholly correctly classified in the map. The data for plots are presented in Tables 10 and 11.

Table 10. Estimated Percent Canopy Cover of Tree Species (>10 feet tall) and Small Tree (<10 feet tall) and Shrub Species for 10 Field-verified Blue Grama Grassland Ground-truth Plots*

	Number (%) of plots with the species	Percent of plots with cover <10 percent	Percent of plots with cover between 10 and 50 percent	Percent of plots with cover >50 percent
Tree Species				
-none recorded				
Small Tree / Shrub Species				
Oneseed juniper	8 (80%)	80%		
Piñon pine	4 (40%)	40%		
Snakeweed	2 (20%)	10%	10%	
Big sagebrush	1 (10%)	10%		
Skunkbush sumac	4 (40%)	40%		
Chamisa	2 (20%)	20%		
Gooseberry sp.	2 (20%)	20%		

* Only the three most abundant species were recorded for trees and for small trees and shrubs in each plot. Blank spaces represent 0% cover.

Table 11. Estimated Percent Total Tree or Shrub Canopy Cover and Ground Cover for Correctly Classified Blue Grama Grassland Ground-truth Plots, Field-verified Blue Grama Grassland Ground-truth Plots, and All Ground-truth Plots That Were at Least Partially Classified as Blue Grama Grassland

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Correctly classified plots (n = 6)							**2.5 (2.1)** (n = 2)	**No Data**
Cover <10%	0%	0%	67%	17%	100%	80%		
Cover 10% to 50%	100%	83%	33%	33%	0%	20%		
Cover >50%	0%	17%	0%	50%	0%	0%		
Field-verified blue grama grassland plots (n = 10)							**2.6 (1.5)** (n = 3)	**4.0 (-)** (n = 1)
Cover <10%	0%	0%	50%	20%	80%	88%		
Cover 10% to 50%	100%	70%	50%	50%	20%	13%		
Cover >50%	0%	30%	0%	30%	0%	0%		
All plots at least partly classified as blue grama grassland (n = 13)							**2.0 (1.2)** (n = 5)	**44.5 (38.0)** (n = 4)
Cover <10%	31%	15%	62%	25%	75%	91%		
Cover 10% to 50%	69%	77%	31%	50%	17%	9%		
Cover >50%	0%	8%	7%	25%	8%	0%		

How ground-truth plots were classified: Figure 12 shows how the areas within the 10 field-verified blue grama grassland ground-truth plots were classified in the current map.

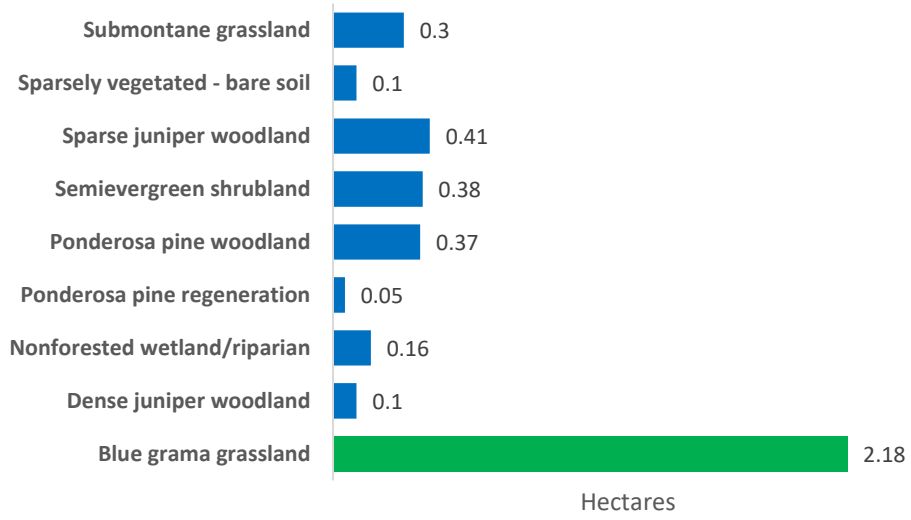

Figure 12. Map classifications of field-verified blue grama grassland ground-truth plots

Dense Juniper Woodland

Figure 13 shows photos from a correctly classified plot.

Figure 13. Views of plot 9 to the a) north, b) east, c) south, and d) west from the plot center

Narrative description: These woodlands are dominated by oneseed juniper, with at least 30 percent total woodland tree canopy cover. Depending on the site, mature junipers may be either greater than or less than 10 feet tall (therefore, sometimes counted as tree species and sometimes counted as small tree / shrub species). Occasional mature piñon or ponderosa pine may be present, but canopy cover of these species is generally less than 10 percent.

Elevation range and total area as mapped: The minimum mapped elevation of this vegetative community was 5,365 feet above sea level, and the maximum mapped elevation was 7,498 feet above sea level. The total area mapped for this vegetative community within the study area was 22,307 acres.

Ground-truth plot data: There were 30 ground-truth plots in this vegetative community, and 27 of those ground-truth plots were partially or wholly correctly classified in the map. The data for plots are presented in Tables 12 and 13.

Table 12. Estimated Percent Canopy Cover of Tree Species (>10 feet tall) and Small Tree (<10 feet tall) and Shrub Species for Field-verified Dense Juniper Plots

	Number (%) of plots with the species	Percent of plots with cover <10 percent	Percent of plots with cover 10 to 50 percent	Percent of plots with cover >50 percent
Tree Species				
Oneseed juniper	26 (87%)	30%	40%	17%
Piñon pine	14 (47%)	40%	7%	
Ponderosa pine	1 (3%)	3%		
Wavyleaf oak	1 (3%)	3%		
Small Tree / Shrub Species				
Oneseed juniper	27 (90%)	43%	47%	
Piñon pine	24 (80%)	23%	3%	
Gambel oak	8 (27%)	27%		
Wavyleaf oak	5 (17%)	17%		
Big sagebrush	4 (13%)	13%		
Skunkbush sumac	3 (10%)	3%	7%	
Mountain mahogany	3 (10%)	10%		
New Mexico olive	1 (3%)	3%		
Snakeweed	1 (3%)	3%		
Apache plume	1 (3%)	3%		
Fourwing saltbush	1 (3%)	3%		
Sand sage	1 (3%)	3%		

* Only the three most abundant species were recorded for trees and for small trees and shrubs in each plot. Blank spaces represent 0% cover.

Table 13. Estimated Percent Total Tree or Shrub Canopy Cover and Ground Cover for Correctly Classified Dense Juniper Woodland Ground-truth Plots, Field-verified Dense Juniper Woodland Ground-truth Plots, and All Plots That Were at Least Partially Classified as Dense Juniper Woodland

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Correctly classified plots (n = 27)							**45.2 (12.4)** (n = 27)	**No Data**
Cover <10%	30%	7%	38%	33%	22%	54%		
Cover 10% to 50%	70%	89%	58%	59%	59%	46%		
Cover >50%	0%	4%	4%	7%	19%	0%		
Field-verified dense juniper woodland plots (n = 30)							**45.4 (13.4)** (n = 30)	**No Data**
Cover <10%	30%	10%	38%	30%	27%	59%		

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Cover 10% to 50%	70%	87%	59%	60%	57%	41%		
Cover >50%	0%	1%	3%	10%	17%	0%		
All plots at least partly classified as dense juniper woodland (n = 74)							**32.9 (18.3)** (n = 57)	**No Data**
Cover <10%	27%	7%	40%	40%	51%	68%		
Cover 10% to 50%	67%	77%	46%	49%	34%	30%		
Cover >50%	5%	16%	14%	11%	15%	1%		

How ground-truth plots were classified: Figure 14 shows how the areas within the 30 field-verified dense juniper woodland ground-truth plots were classified in the current map.

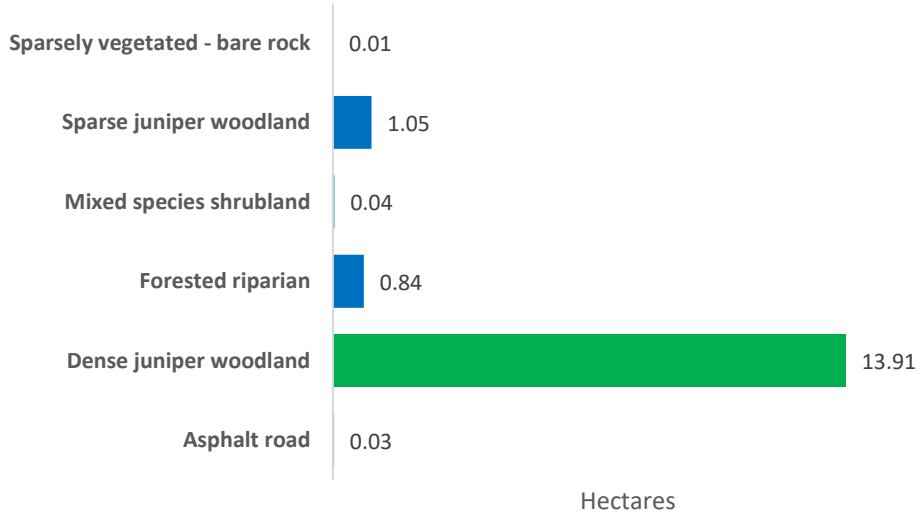

Figure 14. Map classifications of field-verified dense juniper woodland ground-truth plots

Dense Oak Shrubland

Figure 15 shows photos from a correctly classified plot.

Figure 15. Views of plot 512 to the a) north, b) east, c) south, and d) west from the plot center

Narrative description: These shrublands are dominated by shrub forms of oak species, typically Gambel oak or wavyleaf oak, with at least 30 percent total shrub canopy cover. Other local broad-leafed deciduous shrubs, such as skunkbush sumac, mountain mahogany, or New Mexico locust, may be present or co-dominant.

Elevation range and total area as mapped: The minimum mapped elevation of this vegetative community was 6,598 feet above sea level, and the maximum mapped elevation was 9,967 feet above sea level. The total area mapped for this vegetative community within the study area was 4,074 acres.

Ground-truth plot data: There were 17 ground-truth plots in this vegetative community, and seven of those ground-truth plots were partially or wholly correctly classified in the map. The data for plots are presented in Tables 14 and 15.

Table 14. Estimated Percent Canopy Cover of Tree Species (>10 feet tall) and Small Tree (<10 feet tall) and Shrub Species for 17 Field-verified Dense Oak Shrubland Ground-truth plots*

	Number (%) of plots with the species	Percent of plots with cover <10 percent	Percent of plots with cover between 10 and 50 percent	Percent of plots with cover >50 percent
Tree Species				
Ponderosa pine	4 (24%)	4 (24%)		
Small Tree / Shrub Species				
Gambel oak	14 (82%)		53%	29%
Wavyleaf oak	5 (29%)	6%	18%	6%
New Mexico locust	5 (29%)	12%	18%	
Mountain mahogany	3 (18%)	18%		
Oneseed juniper	2 (12%)	12%		
Ponderosa pine	1 (6%)	6%		
Apache plume	1 (6%)		6%	
Gooseberry sp.	1 (6%)	6%		

* Only the three most abundant species were recorded for trees and for small trees and shrubs in each plot. Blank spaces represent 0% cover.

Table 15. Estimated Percent Total Tree or Shrub Canopy Cover and Ground Cover for Correctly Classified Aspen Regeneration Ground-truth Plots, Field-verified Aspen Regeneration Ground-truth Plots, and All Ground-truth Plots That Were at Least Partially Classified as Aspen Regeneration

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Correctly classified plots (n = 7)							**3.0 (-)** (n = 1)	**65.6 (25.6)** (n = 5)
Cover <10%	86%	71%	0%	71%	14%	86%		
Cover 10% to 50%	14%	29%	57%	14%	86%	14%		
Cover >50%	0%	0%	43%	14%	0%	0%		
Field-verified dense oak shrubland plots (n = 17)							**2.5 (0.6)** (n = 4)	**53.3 (19.5)** (n = 12)
Cover <10%	53%	35%	12%	47%	12%	94%		
Cover 10% to 50%	47%	65%	71%	47%	82%	6%		
Cover >50%	0	0%	18%	6%	6%	0%		
All plots at least partly classified as dense oak shrubland (n = 11)							**35.0 (45.3)** (n = 2)	**57.3 (30.5)** (n = 6)
Cover <10%	64%	45%	27%	73%	27%	73%		
Cover 10% to 50%	36%	36%	45%	18%	64%	27%		
Cover >50%	0%	18%	27%	9%	9%	0%		

How ground-truth plots were classified: Figure 16 shows how the areas within the 17 field-verified dense oak shrubland ground-truth plots were classified in the current map.

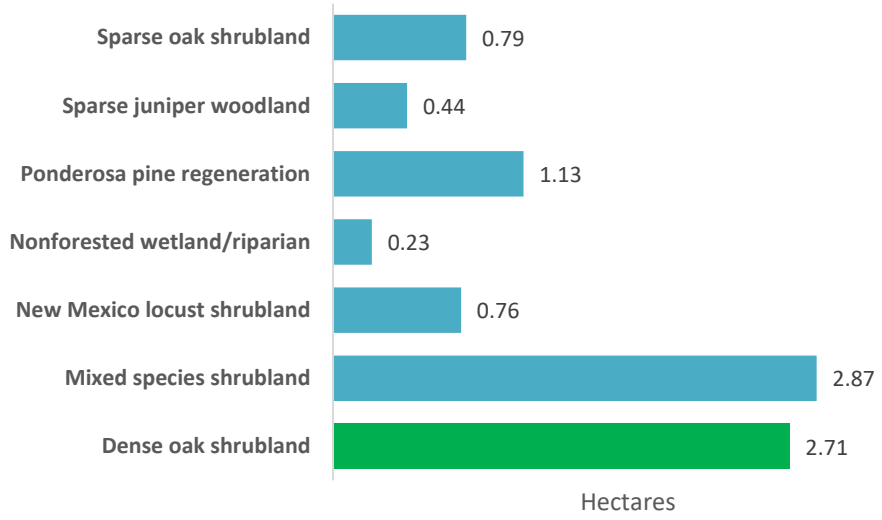

Figure 16. Map classifications of field-verified dense oak shrubland ground-truth plots

Forested Riparian

Figure 17 shows photos from a correctly classified plot.

Figure 17. Views of plot 456 to the a) north, b) east, c) south, and d) west from the plot center

Narrative description: Forested riparian areas are identified by the presence of diagnostic tree species. These include boxelder, narrowleaf cottonwood, and Rio Grande cottonwood.

Elevation range and total area as mapped: The minimum mapped elevation of this vegetative community was 5,366 feet above sea level, and the maximum mapped elevation was 7,034 feet above sea level. The total area mapped for this vegetative community within the study area was 1,107 acres.

Ground-truth plot data: There were 10 field-verified ground-truth plots in this vegetative community, and all of those ground-truth plots were partially or wholly correctly classified in the map. Not all of the field-verified plots had sufficient data to be included in part of Table 16 or in Table 17. The data for plots are presented in Tables 16 and 17.

Table 16. Estimated Percent Canopy Cover of Tree Species (>10 feet tall) and Small Tree (<10 feet tall) and Shrub Species for 10 Field-verified Forested Riparian Plots*

	Number (%) of plots with the species	Percent of plots with cover <10 percent	Percent of plots with cover between 10 and 50 percent	Percent of plots with cover >50 percent
Tree Species				
Narrowleaf cottonwood	6 (60%)	10%	50%	
Oneseed juniper	6 (60%)	50%	10%	
Rio Grande cottonwood	5 (50%)		10%	40%
Russian olive	4 (40%)		40%	
Box elder	4 (40%)	10%	30%	
Saltcedar	1 (10%)	10%		
Gambel oak	1 (10%)	10%		
Chokecherry	1 (10%)		10%	
Water birch	1 (10%)		10%	
Ponderosa pine	1 (10%)	10%		
Small Tree / Shrub Species (recorded on 6 plots)				
Skunkbush sumac	2 (33%)	17%	17%	
New Mexico olive	2 (33%)		33%	
New Mexico locust	1 (17%)	17%		
Willow sp.	1 (17%)	17%		
Apache plume	1 (17%)		17%	
Chokecherry	1 (17%)	17%		
Oneseed juniper	1 (17%)	17%		
Piñon pine	1 (17%)	17%		

* Only the three most abundant species were recorded for trees and for small trees and shrubs in each plot. Blank spaces represent 0% cover.

Table 17. Estimated Percent Total Tree or Shrub Canopy Cover and Ground Cover for Correctly Classified and Field-verified Forested Riparian Ground-truth Plots, and All Ground-truth Plots That Were at Least Partially Classified as Forested Riparian

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Correctly classified and field-verified plots (n = 6)							**No Data**	**No Data**
Cover <10%	50%	33%	50%	50%	50%	17%		
Cover 10% to 50%	50%	33%	33%	50%	50%	83%		
Cover >50%	0%	33%	17%	0%	0%	0%		
All plots at least partly classified as forested riparian (n = 9)							**82 (9.9)** (n = 2)	**28 (-)** (n = 1)

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Cover <10%	44%	33%	44%	44%	56%	33%		
Cover 10% to 50%	44%	33%	33%	44%	44%	67%		
Cover >50%	11%	33%	22%	11%	0%	0%		

How ground-truth plots were classified: Figure 18 shows how the areas within the 10 field-verified forested riparian ground-truth plots were classified in the current map.

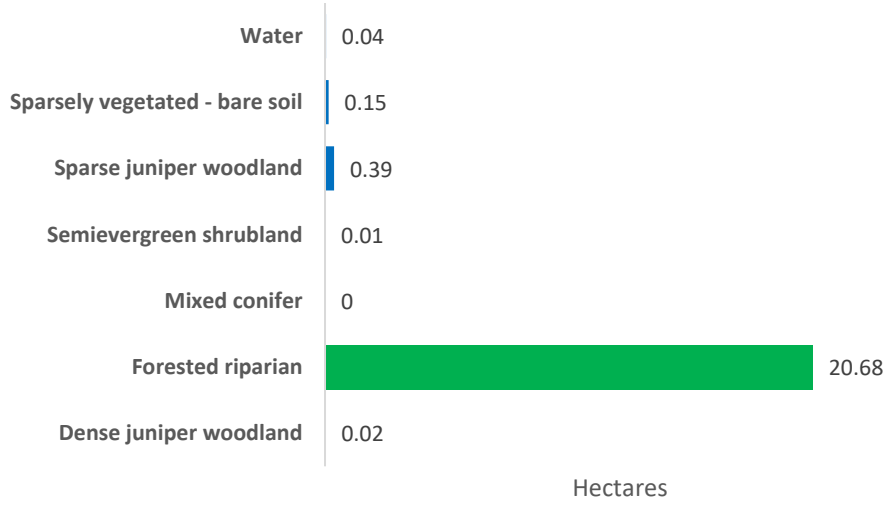

Figure 18. Map of Classifications of forested riparian ground-truth plots

Las Conchas Recovering Grassland

Figure 19 shows photos from a correctly classified plot.

Figure 19. Views of plot 402 to the a) north, b) east, c) south, and d) west from the plot center

Narrative description: Las Conchas recovering grasslands are areas that experienced very high tree mortality during the Las Conchas wildfire in 2011, and where current vegetation growth is not dominated by any tree or shrub species.

Elevation range and total area as mapped: The minimum mapped elevation of this vegetative community was 6,665 feet above sea level, and the maximum mapped elevation was 10,504 feet above sea level. The total area mapped for this vegetative community within the study area was 3,542 acres.

Ground-truth plot data: There was one field-verified ground-truth plot in this vegetative community, which was correctly classified. The data for plots are presented in Tables 18 and 19.

Table 18. Estimated Percent Canopy Cover of Tree Species (>10 feet tall) and Small Tree (<10 feet tall) and Shrub Species for One Los Conchas Recovering Grassland Ground-truth Plot

	Number (%) of plots with the species	Percent of plots with cover <10 percent	Percent of plots with cover between 10 and 50 percent	Percent of plots with cover >50 percent
Tree Species				
None				
Small Tree / Shrub Species				
New Mexico locust	1 (100%)	100%		

Only the three most abundant species were recorded for trees and for small trees and shrubs in the plot. Blank spaces represent 0% cover.

Table 19. Estimated Percent Total Tree Canopy Cover and Ground Cover for Correctly Classified and Field-Verified Los Conchas Recovering Grassland Ground-truth plot and All Ground-truth Plots That Were at Least Partially Classified as Los Conchas Recovering Grassland.

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Correctly classified and field-verified plots (n = 1)							**No Data**	**No Data**
Cover < 10%	0%	0%	100%	0%	100%	100%		
Cover 10% to 50%	100%	0%	0%	100%	0%	0%		
Cover > 50%	0%	100%	0%	0%	0%	0%		
All plots at least partly classified as Las Conchas recovering grassland (n = 2)							**No Data**	**No Data**
Cover < 10%	50%	0%	50%	50%	50%	50%		
Cover 10% to 50%	50%	50%	50%	50%	0%	0%		
Cover > 50%	0%	50%	0%	0%	50%	50%		

How ground-truth plots were classified: Figure 20 shows how the area within the one field-verified Las Conchas recovering grassland ground-truth plot was classified in the current map.

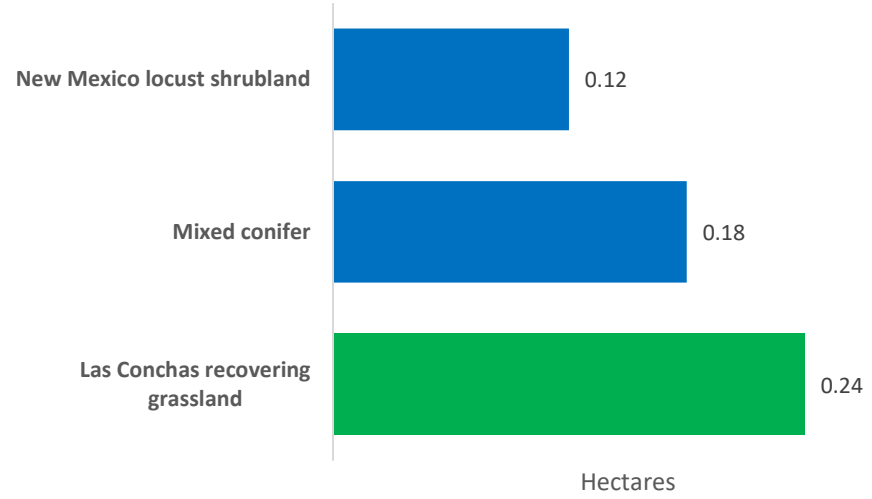

Figure 20. Map classifications of Las Conchas recovering grassland ground-truth plot

Mixed conifer

Figure 21 shows photos from a correctly classified plot.

Figure 21. Views of plot 1506 to the a) north, b) east, c) south, and d) west from the plot center

Narrative description: Mixed conifer forest or woodland stands have a moderately open to dense tree canopy. The overstory contains a mixture of conifer species, potentially including ponderosa pine, douglas-fir, white fir, and limber pine. Conifers other than ponderosa pine make up at least 10 percent of the overstory canopy cover present on the site. Oneseed juniper may be present.

Elevation range and total area as mapped: The minimum mapped elevation of this vegetative community was 6,125 feet above sea level, and the maximum mapped elevation was 9,877 feet above sea level. The total area mapped for this vegetative community within the study area was 5,707 acres.

Ground-truth plot data: There were 19 field-verified ground-truth plots in this vegetative community, and 11 of those ground-truth plots were partially or wholly correctly classified in the map. The data for plots are presented in Tables 20 and 21. Not all 19 field-verified plots had sufficient data to be included in the tables.

Table 20. Estimated Percent Canopy Cover of Tree Species (>10 feet tall) and Small Tree (<10 feet tall) and Shrub Species for Mixed Conifer Ground-truth Plots*

	Number (%) of plots with the species	Percent of plots with cover <10 percent	Percent of plots with cover between 10 and 50 percent	Percent of plots with cover >50 percent
Tree Species (n = 18 plots)				
Ponderosa pine	18 (100%)	39%	56%	6%
Douglas-fir	17 (94%)	11%	83%	
White fir	7 (39%)	33%	6%	
Gambel oak	3 (17%)	11%	6%	
Water birch	2 (11%)	6%	6%	
Limber pine	1 (6%)	6%		
Small Tree / Shrub Species (n = 14 plots)				
Gambel oak	10 (71%)	29%	43%	
Quaking aspen	7 (50%)	36%	7%	7%
Douglas-fir	7 (50%)	50%		
Ponderosa pine	4 (29%)	29%		
New Mexico locust	2 (14%)		14%	
Chokecherry	1 (7%)	7%		
White fir	1 (7%)	7%		
Gooseberry sp.	1 (7%)	7%		

* Only the three most abundant species were recorded for trees and for small trees and shrubs in each plot. Blank spaces represent 0% cover.

Table 21. Estimated Percent Total Tree Canopy Cover and Ground Cover for Correctly Classified Mixed Conifer Ground-truth Plots, All Mixed Conifer Ground-truth Plots, and All Ground-truth Plots That Were at Least Partially Classified as Mixed Conifer

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Correctly classified plots (n = 9)							**48 (12.7)** (n = 10)	**No Data**
Cover <10%	78%	33%	22%	89%	0%	38%		
Cover 10% to 50%	22%	67%	33%	11%	100%	63%		
Cover >50%	0%	0%	44%	0%	0%	0%		
Field-verified mixed conifer plots (n = 16)							**46.1 (13.8)** (n = 13)	**No Data**
Cover <10%	50%	19%	13%	94%	13%	36%		
Cover 10% to 50%	38%	63%	44%	6%	88%	64%		
Cover >50%	13%	19%	44%	0%	0%	0%		
All plots at least partly classified as mixed conifer (n = 18)							**47.4 (12.6)**	**No Data**

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
							(n = 15)	
Cover <10%	61%	28%	22%	78%	39%	47%		
Cover 10% to 50%	33%	56%	39%	22%	61%	53%		
Cover >50%	6%	17%	39%	0%	0%	0%		

How ground-truth plots were classified: Figure 22 shows how the areas within the 19 field-verified mixed conifer ground-truth plots were classified in the current map.

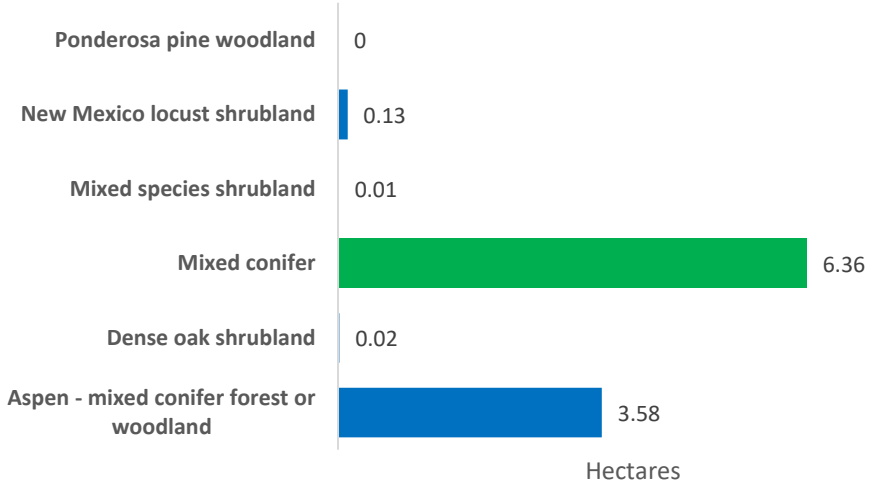

Figure 22. Map classification of field-verified mixed conifer ground-truth plots

Mixed Species Shrubland

Photos: There were no photos for this vegetative community.

Narrative description: Mixed species shrublands were defined as low-growing shrub communities at higher elevations (elevational ranges that would support ponderosa pine, or higher). They could be dominated by Fendler's buckbrush, or by other low-growing shrubs. The herbaceous layer is sparse, and shrub cover is greater than 10 percent.

Elevation range and total area as mapped: The minimum mapped elevation of this vegetative community was 6,195 feet above sea level, and the maximum mapped elevation was 10,411 feet above sea level. The total area mapped for this vegetative community within the study area was 5,045 acres.

Ground-truth plot data: There were no ground-truth plots for this vegetative community.

How ground-truth plots were classified: There were no ground truth plots for this vegetative community.

Montane Grassland

Figure 23 shows photos from a correctly classified plot.

Figure 23. Views of plot 417 to the a) north, b) east, c) south, and d) west from the plot center

Narrative description: Montane grasslands have open to dense perennial grass cover. They generally have one or more bunch grass species in the genera *Blepharoneuron*, *Danthonia*, *Festuca*, and *Muhlenbergia*. Trees are rare or incidental. Shrubs may be present at less than 10 percent cover.

Elevation range and total area as mapped: The minimum mapped elevation of this vegetative community was 8,135 feet above sea level, and the maximum mapped elevation was 10,479 feet above sea level. The total area mapped for this vegetative community within the study area was 1,348 acres.

Ground-truth plot data: There were two ground-truth plots in this vegetative community, and all of the ground-truth plots were partially or wholly correctly classified in the map. The data for plots are presented in Tables 22 and 23.

Table 22. Estimated Percent Canopy Cover of Tree Species (>10 feet tall) and Small Tree (<10 feet tall) and Shrub Species for Two Montane Grassland Ground-truth Plots*

	Number (%) of plots with the species	Percent of plots with cover < 10 percent	Percent of plots with cover between 10 and 50 percent	Percent of plots with cover > 50 percent
Tree Species				
None				
Small Tree / Shrub Species				
Oceanspray	2 (100%)	100%		
Gambel oak	1 (50%)	50%		

* Only the three most abundant species were recorded for trees and for small trees and shrubs in each plot. Blank spaces represent 0% cover.

Table 23. Estimated Percent Total Tree Canopy Cover and Ground Cover for Correctly Classified and Field-verified Montane Grassland Ground-truth Plots, and All Ground-truth Plots That Were at Least Partially Classified as Montane Grassland

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Correctly-classified and field-verified plots (n = 2)							**No Data**	**No Data**
Cover <10%	0%	0%	100%	100%	0%	100%		
Cover 10% to 50%	0%	0%	0%	0%	50%	0%		
Cover >50%	100%	100%	0%	0%	50%	0%		
All plots at least partly classified as montane grassland (n = 2)							**No Data**	**No Data**
Cover <10%	0%	0%	100%	100%	0%	100%		
Cover 10% to 50%	0%	0%	0%	0%	50%	0%		
Cover >50%	100%	100%	0%	0%	50%	0%		

How ground-truth plots were classified: Figure 24 shows how the areas within the two field-verified montane grassland ground-truth plots were classified in the current map.

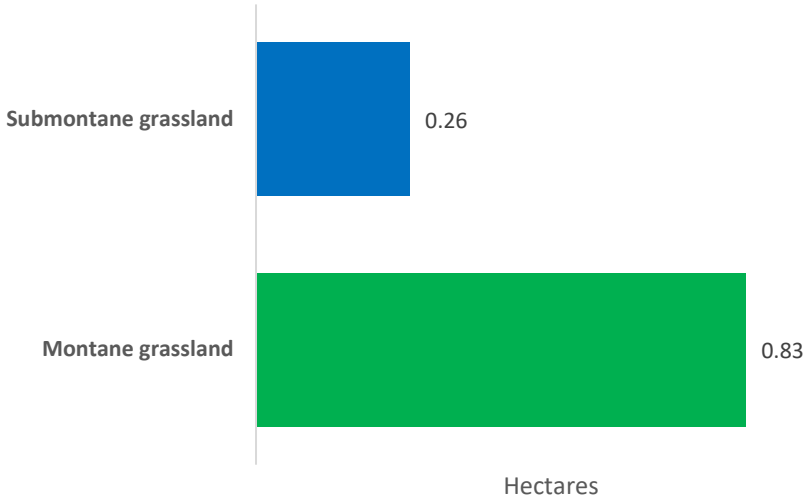

Figure 24. Map classification of field-verified montane grassland ground-truth plots

New Mexico Locust Shrubland

Figure 25 shows photos from a correctly classified plot.

Figure 25. Views of plot 550 to the a) north, b) east, c) south, and d) west from the plot center

Narrative description: The shrub overstory is dominated by New Mexico locust, but frequently with co-occurring Gambel oak and/or regenerating quaking aspen.

Elevation range and total area as mapped: The minimum mapped elevation of this vegetative community was 6,222 feet above sea level, and the maximum mapped elevation was 9,930 feet above sea level. The total area mapped for this vegetative community within the study area was 7,925 acres.

Ground-truth plot data: There were 10 field-verified ground-truth plots in this vegetative community, and nine of those ground-truth plots were partially or wholly correctly classified in the map. The data for plots are presented in Tables 24 and 25. Not all field-verified plots had sufficient data to be included in Table 25.

Table 24. Estimated Percent Canopy Cover of Tree Species (>10 feet tall) and Small Tree (<10 feet tall) and Shrub Species for 10 New Mexico Locust Ground-truth Plots*

	Number (%) of plots with the species	Percent of plots with cover <10 percent	Percent of plots with cover between 10 and 50 percent	Percent of plots with cover >50 percent
Tree Species				
Gambel oak	2 (20%)	20%		
Small Tree / Shrub Species				
New Mexico locust	10 (100%)	0%	40%	60%
Gambel oak	7 (70%)	60%	10%	
Ponderosa pine	2 (20%)	20%		
American red raspberry	1 (10%)	10%		
Woods' rose	1 (10%)	10%		
Gooseberry sp.	1 (10%)	10%		

* Only the three most abundant species were recorded for trees and for small trees and shrubs in each plot. Blank spaces represent 0% cover.

Table 25. Estimated Percent Total Tree Canopy Cover and Ground Cover for Correctly Classified New Mexico Locust Shrubland Ground-truth Plots, Field-verified New Mexico Locust Shrubland Ground-truth Plots, and All Ground-truth Plots That Were at Least Partially Classified as New Mexico Locust Shrubland

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Correctly classified plots (n = 7)							**No Data**	**No Data**
Cover <10%	29%	29%	29%	71%	67%	50%		
Cover 10% to 50%	43%	29%	57%	29%	17%	50%		
Cover >50%	29%	43%	14%	0%	17%	0%		
Field-verified New Mexico locust plots (n = 8)							**3 (-)** (n = 1)	**47 (-)** (n = 1)
Cover <10%	25%	25%	25%	75%	71%	57%		
Cover 10% to 50%	50%	25%	63%	25%	14%	43%		
Cover >50%	25%	50%	14%	0%	14%	0%		
All plots at least partly classified as New Mexico locust shrubland (n = 21)							**28.6 (10.1)** (n = 3)	**No Data**
Cover <10%	38%	14%	38%	71%	60%	57%		
Cover 10% to 50%	38%	33%	52%	29%	35%	43%		
Cover >50%	24%	52%	10%	0%	5%	0%		

How ground-truth plots were classified: Figure 26 shows how the areas within the 10 field-verified New Mexico locust shrubland ground-truth plots were classified in the current map.

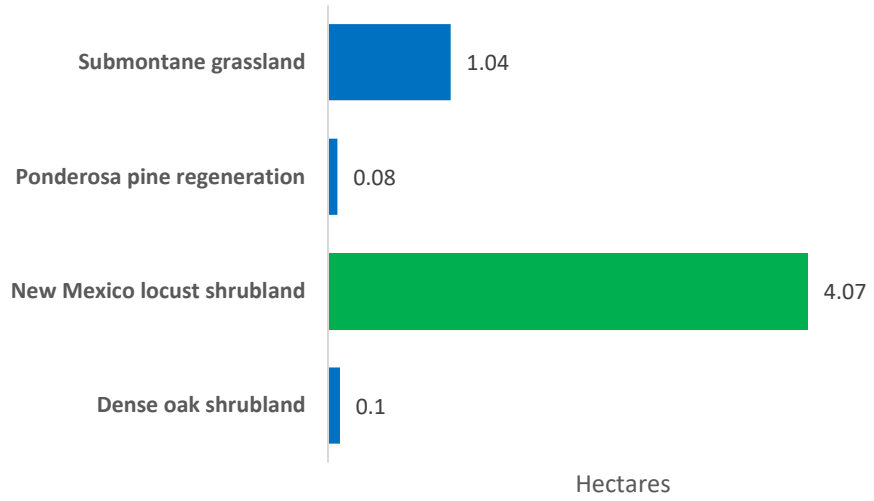

Figure 26. Map classification of field-verified New Mexico locust shrubland ground-truth plots

Nonforested wetland/riparian

Figure 27 shows photos from a correctly classified plot.

Figure 27. Views of plot 625 to the a) north, b) east, c) south, and d) west from the plot center

Narrative description: Nonforested wetland or riparian communities contain diagnostic facilitative or obligate wetland species, or shrub or herbaceous species that are distinctly different from or in much greater density than those found in adjacent upland areas. Examples of nonforested wetland or riparian species in this area include coyote willow, sedges and rushes, cattails, reed canarygrass, skunkbush sumac, and in some cases, false tarragon. Total tree canopy cover is less than 10 percent.

Elevation range and total area as mapped: The minimum mapped elevation of this vegetative community was 5,367 feet above sea level, and the maximum mapped elevation was 7,645 feet above sea level. The total area mapped for this vegetative community within the study area was 668 acres.

Ground-truth plot data: There were 15 ground-truth plots in this vegetative community, and 10 of those ground-truth plots were partially or wholly correctly classified in the map. The data for plots are presented in Tables 26 and 27.

Table 26. Estimated Percent Canopy Cover of Tree Species (>10 feet tall) and Small Tree (<10 feet tall) and Shrub Species for 15 Nonforested Wetland/Riparian Ground-truth Plots*

	Number (%) of plots with the species	Percent of plots with cover <10 percent	Percent of plots with cover between 10 and 50 percent	Percent of plots with cover >50 percent
Tree Species				
Oneseed juniper	1 (7%)	7%		
Russian olive	1 (7%)	7%		
Narrowleaf cottonwood	1 (7%)	7%		
Box elder	1 (7%)	7%		
Wavyleaf oak	1 (7%)	7%		
Small Tree / Shrub Species				
Coyote willow	8 (53%)	7%	20%	27%
Skunkbush sumac	4 (27%)	7%	20%	
Apache plume	3 (20%)	13%	7%	
Rio Grande cottonwood	3 (20%)	13%	7%	
Pinon pine	2 (13%)	13%		
Cattail sp.	2 (13%)	7%	7%	
Oneseed juniper	2 (13%)	13%		
Gooseberry sp.	2 (13%)	13%		
Chamisa sp.	1 (7%)	7%		
Wavyleaf oak	1 (7%)	7%		
Big sagebrush	1 (7%)	7%		
New Mexico olive	1 (7%)	7%		
Ponderosa pine	1 (7%)	7%		

* Only the three most abundant species were recorded for trees and for small trees and shrubs in each plot. Blank spaces represent 0% cover.

Table 27. Estimated Percent Total Tree Canopy Cover and Ground Cover for Correctly Classified Nonforested Wetland/Riparian Ground-truth Plots, Field-verified Nonforested Wetland/Riparian Ground-truth Plots, and all Ground-truth Plots That Were at Least Partially Classified as Nonforested Wetland/Riparian

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Correctly classified plots (n =10)							**2 (-)** (n = 1)	**31.5 (20.5)** (n=2)
Cover <10%	22%	0%	20%	70%	90%	100%		
Cover 10% to 50%	44%	30%	80%	30%	10%	0%		

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Cover > 50%	33%	70%	0%	0%	0%	0%		
Field-verified nonforested wetland/riparian plots (n = 15)							**2 (-)** (n = 1)	**35.3 (15.9)** (n = 3)
Cover <10%	29%	0%	13%	73%	93%	100%		
Cover 10% to 50%	36%	20%	87%	27%	7%	0%		
Cover >50%	36%	80%	0%	0%	0%	0%		
All plots at least partly classified as nonforested wetland/riparian (n = 14)							**12.7 (11.6)** (n = 3)	**31.5 (20.5)** (n = 2)
Cover <10%	23%	7%	21%	71%	86%	92%		
Cover 10% to 50%	46%	50%	64%	29%	14%	8%		
Cover >50%	31%	43%	14%	0%	0%	0%		

How ground-truth plots were classified: Figure 28 shows how the areas within the 15 field-verified nonforested wetland/riparian ground-truth plots were classified in the current map.

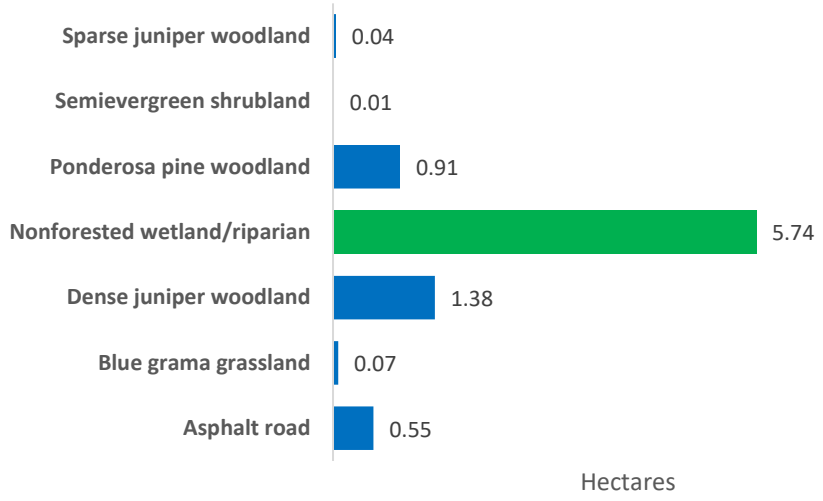

Figure 28. Map classification of field-verified nonforested wetland/riparian ground-truth plots

Ponderosa Pine Forest

Figure 29 shows photos from a correctly classified plot.

Figure 29. Views of plot 106 to the a) north, b) east, c) south, and d) west from the plot center

Narrative description: Ponderosa pine forest has a moderately dense to dense ponderosa pine canopy (>50 percent canopy cover). There may be occasional occurrences of Douglas-fir or juniper species. The herbaceous layer is sparse. Shrubs may be present. A high percent of litter ground cover is common.

Elevation range and total area as mapped: The minimum mapped elevation of this vegetative community was 6,286 feet above sea level, and the maximum mapped elevation was 7,779 feet above sea level. The total area mapped for this vegetative community within the study area was 139 acres.

Ground-truth plot data: There was one ground-truth plot in this vegetative community, and it was correctly classified in the map. The data for the plot are presented in Tables 28 and 29.

Table 28. Estimated Percent Canopy Cover of Tree Species (>10 feet tall) and Small Tree (<10 feet tall) and Shrub Species for One Ponderosa Pine Ground-truth Plot*

	Number (%) of plots with the species	Percent of plots with cover <10 percent	Percent of plots with cover between 10 and 50 percent	Percent of plots with cover >50 percent
Tree Species				
Ponderosa pine	1 (100%)			100%
Oneseed juniper	1 (100%)	100%		
Gambel oak	1 (100%)	100%		
Small Tree / Shrub Species				
Gambel oak	1 (100%)	100%		
Oneseed juniper	1 (100%)	100%		
Pinon pine	1 (100%)	100%		

* Only the three most abundant species were recorded for trees and for small trees and shrubs in each plot. Blank spaces represent 0% cover.

Table 29. Estimated Percent Total Tree Canopy Cover and Ground Cover for the Correctly Classified and Field-verified Ponderosa Pine Forest Ground-truth Plot, and for all Ground-truth Plots That Were at Least Partially Classified as Ponderosa Pine Forest

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Correctly classified and field-verified plots (n = 1)							**70 (-)** (n=1)	**No Data**
Cover <10%	100%			100%	100%	100%		
Cover 10% to 50%		100%						
Cover >50%			100%					
All plots at least partly classified as Ponderosa pine forest (n = 2)							**57.5 (17.7)** (n = 2)	**No Data**
Cover <10%	100%	50%		50%	100%	100%		
Cover 10% to 50%		50%	50%	50%				
Cover >50%			50%					

How ground-truth plots were classified: Figure 30 shows how the area within the one field-verified ponderosa pine forest ground-truth plots was classified in the current map.

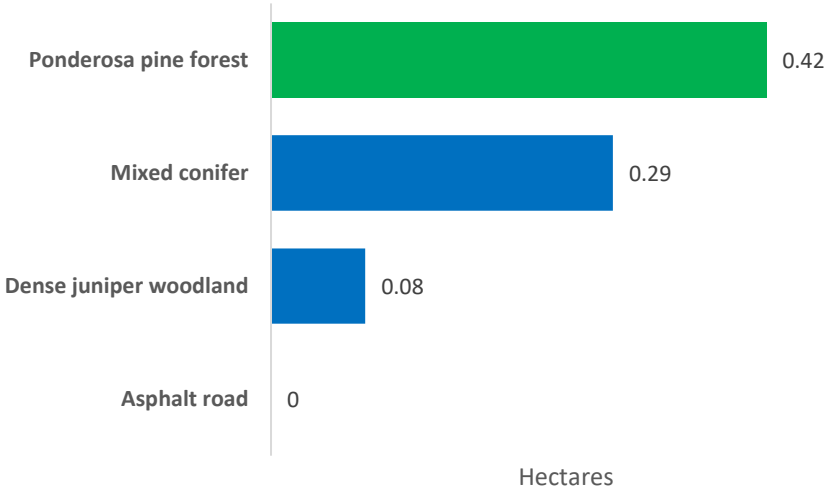

Figure 30. Map classifications of field-verified ponderosa pine forest ground-truth plot

Ponderosa Pine Regeneration

Figure 31 shows photos from a correctly classified plot.

Figure 31. Views of plot 154 to the a) north, b) east, c) south, and d) west from the plot center

Narrative description: Ponderosa pine regeneration consists of predominantly ponderosa pine seedling or saplings, either planted or naturally regenerating. Many areas of ponderosa pine regeneration are pines planted following the Cerro Grande fire. Ponderosa pines have at least 10 percent canopy cover, and no other trees are more abundant.

Elevation range and total area as mapped: The minimum mapped elevation of this vegetative community was 6,394 feet above sea level, and the maximum mapped elevation was 8,682 feet above sea level. The total area mapped for this vegetative community within the study area was 2,862 acres.

Ground-truth plot data: There were 10 field-verified ground-truth plots in this vegetative community, and all of those ground-truth plots were partially or wholly correctly classified in the map. The data for plots are presented in Tables 30 and 31.

Table 30. Estimated Percent Canopy Cover of Tree Species (>10 feet tall) and Small Tree (<10 feet tall) and Shrub Species for 10 Field-verified Ponderosa Pine Regeneration Ground-truth Plots*

	Number (%) of plots with the species	Percent of plots with cover <10 percent	Percent of plots with cover between 10 and 50 percent	Percent of plots with cover >50 percent
Tree Species				
Ponderosa pine	6 (60%)	40%	20%	
Gambel oak	2 (20%)	20%		
Small Tree / Shrub Species				
Ponderosa pine	9 (90%)	20%	70%	
Gambel oak	6 (60%)	30%	30%	
Fendler's buckbrush	6 (60%)	10%	50%	
New Mexico locust	5 (50%)	40%	10%	
Oneseed juniper	2 (20%)	20%		

* Only the three most abundant species were recorded for trees and for small trees and shrubs in each plot. Blank spaces represent 0% cover.

Table 31. Estimated Percent Total Tree Canopy Cover and Ground Cover for Correctly Classified Ponderosa Pine Regeneration Ground-truth Plots, Field-verified Ponderosa Pine Regeneration Ground-truth Plots, and all Ground-truth Plots That Were at Least Partially Classified as Ponderosa Pine Regeneration

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Correctly classified and field-verified plots (n = 10)							**22.3 (5.5)** (n = 3)	**12 (8.9)** (n = 4)
Cover <10%	70%	40%	70%	80%	30%	10%		
Cover 10% to 50%	30%	20%	30%	20%	20%	80%		
Cover >50%	0%	40%	0%	0%	50%	10%		
All plots at least partly classified as ponderosa pine regeneration (n = 24)							**17.1 (14.7)** (n = 8)	**25.6 (15.7)** (n = 11)
Cover <10%	70%	25%	63%	63%	46%	54%		
Cover 10% to 50%	30%	50%	29%	38%	29%	42%		
Cover >50%	0%	25%	8%	0%	25%	4%		

How ground-truth plots were classified: Figure 32 shows how the areas within the 10 field-verified ponderosa pine regeneration ground-truth plots were classified in the current map.

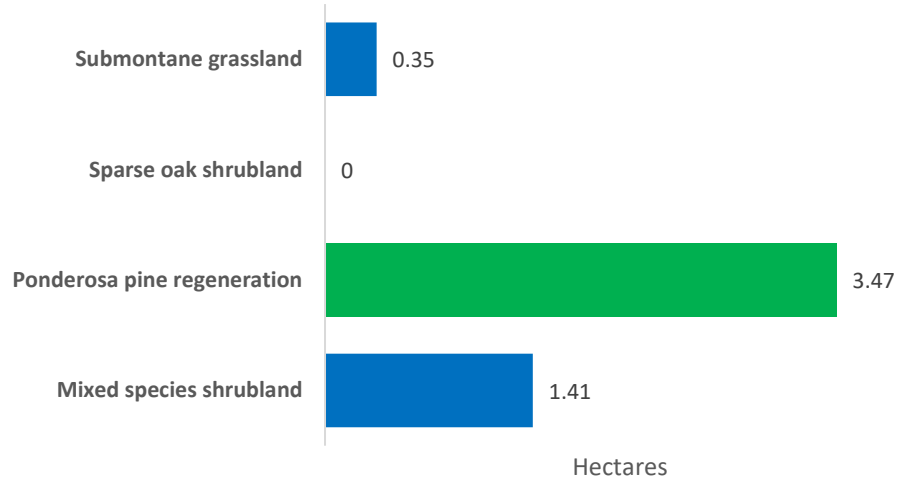

Figure 32. Map classifications of field-verified ponderosa pine regeneration ground-truth plots

Ponderosa Pine Woodland

Figure 33 shows photos from a correctly classified plot.

Figure 33. Views of plot 104 to the a) north, b) east, c) south, and d) west from the plot center

Narrative description: Ponderosa pine woodlands have open to moderately dense tree canopy (>10 percent and <50 percent canopy cover), dominated by ponderosa pines. Juniper may be present.

Elevation range and total area as mapped: The minimum mapped elevation of this vegetative community was 6,220 feet above sea level, and the maximum mapped elevation was 8,518 feet above sea level. The total area mapped for this vegetative community within the study area was 8,199 acres.

Ground-truth plot data: There were 17 ground-truth plots in this vegetative community, and nine of those ground-truth plots were partially or wholly correctly classified in the map. The data for plots are presented in Tables 32 and 33.

Table 32. Estimated Percent Canopy Cover of Tree Species (>10 feet tall) and Small Tree (<10 feet tall) and Shrub Species for 17 Ponderosa Pine Woodland Ground-truth Plots*

	Number (%) of plots with the species	Percent of plots with cover <10 percent	Percent of plots with cover between 10 and 50 percent	Percent of plots with cover >50 percent
Tree Species				
Ponderosa pine	17 (100%)		100%	
Oneseed juniper	9 (53%)	35%	18%	
Douglas-fir	6 (35%)	35%		
Pinon pine	3 (18%)	12%	6%	
Limber pine	3 (18%)	6%		
Rocky Mountain juniper	2 (12%)	12%		
Gambel oak	1 (6%)	6%		
Small Tree / Shrub Species				
Gambel oak	9 (53%)	47%	6%	
Oneseed juniper	9 (53%)	47%	6%	
Ponderosa pine	7 (41%)	35%	6%	
Pinon pine	7 (41%)	41%		
New Mexico locust	3 (18%)	6%	12%	
Mountain mahogany	2 (12%)	12%		
Skunkbush sumac	2 (12%)	12%		
Wavyleaf oak	1 (6%)	6%		
Rocky Mountain juniper	1 (6%)	6%		
Gooseberry sp.	1 (6%)	6%		
Limber pine	1 (6%)	6%		
Woods' rose	1 (6%)	6%		
Apache plume	1 (6%)	6%		

* Only the three most abundant species were recorded for trees and for small trees and shrubs in each plot. Blank spaces represent 0% cover.

Table 33. Estimated Percent Total Tree Canopy Cover and Ground Cover for Correctly Classified Ponderosa Pine Woodland Ground-truth Plots, Field-verified Ponderosa Pine Woodland Ground-truth Plots, and All Ground-truth Plots That Were at Least Partially Classified as Ponderosa Pine Woodland

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Correctly classified plots (n = 9)							**32.9 (11.7)** (n = 9)	**No Data**
Cover <10%	44%	22%	0%	76%	100%	78%		
Cover 10% to 50%	56%	67%	44%	24%	0%	22%		

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Cover >50%	0%	11%	56%	0%	0%	0%		
Field-verified ponderosa pine woodland plots (n = 17)							**32.8 (10.7)** (n = 16)	**No Data**
Cover <10%	35%	24%	6%	78%	88%	71%		
Cover 10% to 50%	53%	59%	41%	22%	12%	29%		
Cover >50%	12%	18%	53%	0%	0%	0%		
All plots at least partly classified as ponderosa pine woodland (n = 18)							**34 (11.6)** (n = 10)	**38 (11.4)** (n = 3)
Cover <10%	46%	24%	6%	72%	83%	76%		
Cover 10% to 50%	56%	59%	41%	28%	11%	24%		
Cover >50%	0%	18%	53%	0%	6%	0%		

How ground-truth plots were classified: Figure 34 shows how the areas within the 17 field-verified ponderosa pine woodland ground-truth plots were classified in the current map.

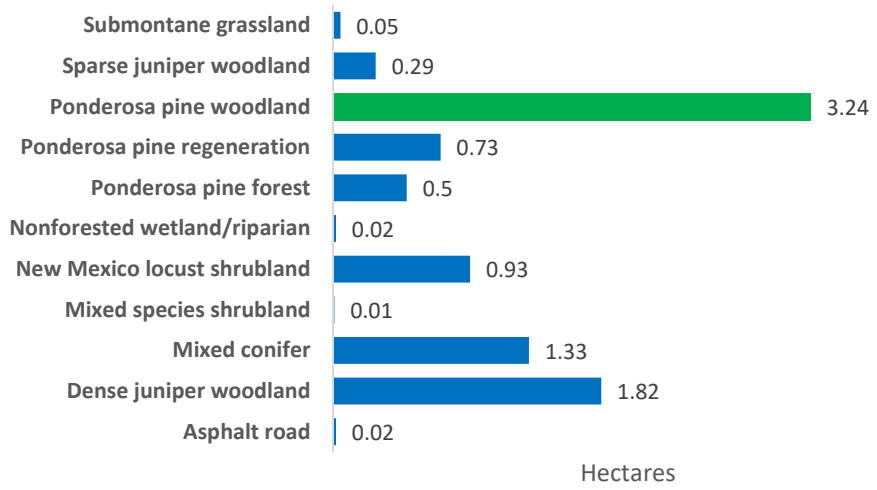

Figure 34. Map classifications of field-verified ponderosa pine woodland ground-truth plots

Semievergreen Shrubland

Figure 35 shows photos from a correctly classified plot.

Figure 35. Views of plot 299 to the a) north, b) east, c) south, and d) west from the plot center

Narrative description: Semievergreen shrublands are generally lower elevation communities dominated by low-growing shrubs with evergreen or semievergreen foliage. Shrub canopy cover is greater than 10 percent, and tree canopy cover (including junipers) is less than 10 percent. Dominant shrub species may include fourwing saltbush, sand sage, fringed sage, winterfat, big sagebrush, or chamisa, but do not include oak species.

Elevation range and total area as mapped: The minimum mapped elevation of this vegetative community was 5,372 feet above sea level, and the maximum mapped elevation was 7,703 feet above sea level. The total area mapped for this vegetative community within the study area was 3,301 acres.

Ground-truth plot data: There were 23 ground-truth plots in this vegetative community, and nine of those ground-truth plots were partially or wholly correctly classified in the map. The data for plots are presented in Tables 34 and 35.

Table 34. Estimated Percent Canopy Cover of Tree Species (>10 feet tall) and Small Tree (<10 feet tall) and Shrub Species for 23 Semievergreen Shrubland Ground-truth Plots*

	Number (%) of plots with the species	Percent of plots with cover <10 percent	Percent of plots with cover between 10 and 50 percent	Percent of plots with cover >50 percent
Tree Species				
Oneseed juniper	6 (26%)	26%		
Pinon pine	4 (17%)	17%		
Ponderosa pine	2 (9%)	9%		
Small Tree / Shrub Species				
Oneseed juniper	18 (78%)	78%		
Pinon pine	10 (43%)	43%		
Big sagebrush	10 (43%)	9%	35%	
Chamisa sp.	4 (17%)	9%		9%
Fourwing saltbush	3 (13%)	9%		4%
Unknown shrub sp.	3 (13%)		13%	
Winterfat	3 (13%)	9%	4%	
Gambel oak	2 (9%)	9%		
Wavyleaf oak	2 (9%)	4%	4%	
Skunkbush sumac	2 (9%)	9%		
Sand sage	2 (9%)	4%	4%	
Mountain mahogany	1 (4%)		4%	
Snakeweed	1 (4%)		4%	
Fringed sage	1 (4%)		4%	

* Only the three most abundant species were recorded for trees and for small trees and shrubs in each plot. Blank spaces represent 0% cover.

Table 35. Estimated Percent Total Tree Canopy Cover and Ground Cover for Correctly Classified Semievergreen Shrubland Ground-truth Plots, Field-verified Semievergreen Shrubland Ground-truth Plots, and All Ground-truth Plots That Were at Least Partially Classified as Semievergreen Shrubland

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Correctly classified plots (n = 9)							**3 (2.9)** (n = 5)	**36.3 (14.3)** (n = 6)
Cover <10%	22%	11%	89%	22%	67%	88%		
Cover 10% to 50%	67%	44%	11%	78%	0%	13%		
Cover >50%	11%	44%	0%	0%	33%	0%		
Field-verified semievergreen shrubland plots (n = 23)							**3.8 (3.6)** (n = 12)	**36.2 (15.4)** (n = 13)

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Cover <10%	35%	13%	70%	39%	52%	91%		
Cover 10% to 50%	61%	65%	26%	52%	9%	5%		
Cover >50%	4%	22%	4%	9%	39%	5%		
All plots at least partly classified as semievergreen shrubland (n = 17)							**4.3 (4.2)** (n = 6)	**36.3 (14.3)** (n = 6)
Cover <10%	29%	24%	76%	41%	71%	88%		
Cover 10% to 50%	65%	41%	24%	41%	12%	6%		
Cover >50%	6%	35%	0%	18%	18%	6%		

How ground-truth plots were classified: Figure 36 shows how the areas within the 23 field-verified semievergreen shrubland ground-truth plots were classified in the current map.

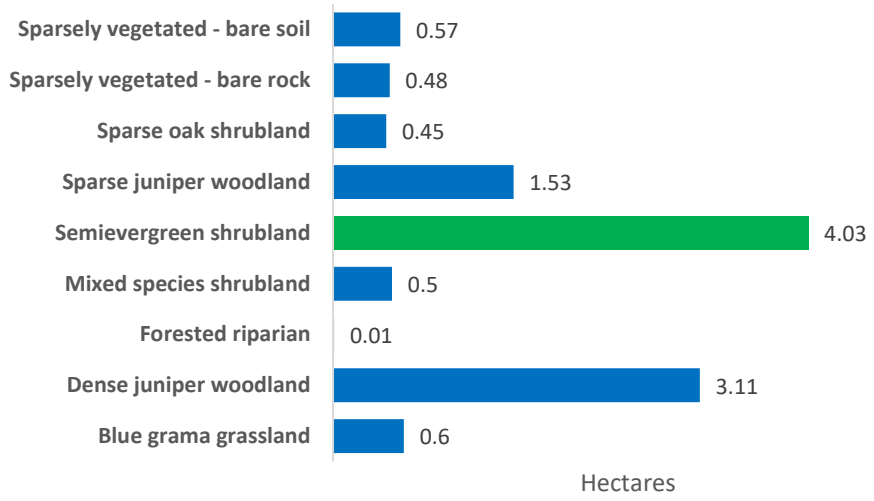

Figure 36. Map classifications of field-verified semievergreen shrubland ground-truth plots

Sparse Juniper Woodland

Figure 37 shows photos from a correctly classified plot.

Figure 37. Views of plot 468 to the a) north, b) east, c) south, and d) west from the plot center

Narrative description: The canopy is dominated by oneseed juniper, but total woodland tree canopy cover is less than 30 percent. The sparse canopy cover may be a result of site conditions, or may be a result of thinning or mastication of woodland trees. Occasional mature piñon pines or ponderosa pines may occur. The herbaceous layer is frequently sparse. Often the oneseed junipers were not more than 10 feet tall, so they were tallied as small trees/shrubs rather than trees during data collection.

Elevation range and total area as mapped: The minimum mapped elevation of this vegetative community was 5,373 feet above sea level, and the maximum mapped elevation was 7,489 feet above sea level. The total area mapped for this vegetative community within the study area was 16,133 acres.

Ground-truth plot data: There were 26 ground-truth plots in this vegetative community, and 18 of those ground-truth plots were partially or wholly correctly classified in the map. The data for plots are presented in Tables 36 and 37.

Table 36. Estimated Percent Canopy Cover of Tree Species (>10 feet tall) and Small Tree (<10 feet tall) and Shrub Species for 26 Sparse Juniper Woodland Ground-truth Plots*

	Number (%) of plots with the species	Percent of plots with cover <10 percent	Percent of plots with cover between 10 and 50 percent	Percent of plots with cover >50 percent
Tree Species				
Oneseed juniper	20 (77%)	15%	62%	
Pinon pine	11 (42%)	42%		
Small Tree / Shrub Species				
Oneseed juniper	25 (96%)	46%	50%	
Pinon pine	22 (85%)	81%	4%	
Wavyleaf oak	6 (23%)	12%	12%	
Chamisa sp.	5 (19%)	15%	4%	
Gambel oak	3 (12%)	8%	4%	
Big sagebrush	3 (12%)	12%		
Skunkbush sumac	3 (12%)	12%		
Gooseberry sp.	2 (8%)	8%		
Snakeweed	2 (8%)	8%		
Fourwing saltbush	2 (8%)	4%	4%	
New Mexico olive	1 (4%)	4%		
Mountain mahogany	1 (4%)	4%		

* Only the three most abundant species were recorded for trees and for small trees and shrubs in each plot. Blank spaces represent 0% cover.

Table 37. Estimated Percent Total Tree Canopy Cover and Ground Cover for Correctly Classified Sparse Juniper Woodland Ground-truth Plots, Field-verified Sparse Juniper Woodland Ground-truth Plots, and All Ground-Truth Plots That Were at Least Partially Classified as Sparse Juniper Woodland

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Correctly classified plots (n = 18)							**18.7 (6.0)** (n = 18)	**No Data**
Cover <10%	28%	0%	56%	33%	61%	65%		
Cover 10% to 50%	72%	88%	44%	50%	22%	35%		
Cover >50%	0%	12%	0%	17%	17%	0%		
Field-verified sparse juniper woodland plots (n = 26)							**19.8 (6.2)** (n = 26)	**No Data**
Cover <10%	23%	0%	50%	23%	58%	60%		
Cover 10% to 50%	77%	89%	50%	58%	23%	40%		
Cover >50%	0%	11%	0%	19%	19%	0%		

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
All plots at least partly classified as sparse juniper woodland (n = 45)							**19.5 (15.1)** (n = 33)	**32 (16.4)** (n = 9)
Cover <10%	33%	9%	42%	29%	56%	81%		
Cover 10% to 50%	67%	76%	56%	53%	27%	19%		
Cover >50%	0%	16%	2%	18%	18%	0%		

How ground-truth plots were classified: Figure 38 shows how the areas within the 26 field-verified sparse juniper woodland ground-truth plots were classified in the current map.

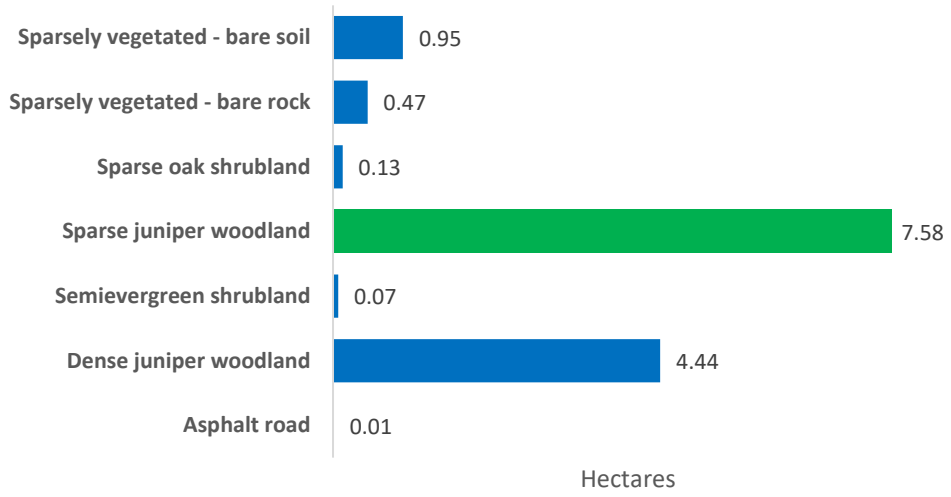

Figure 38. Map classifications of field-verified sparse juniper woodland ground-truth plots

Sparse Oak Shrubland

Figure 39 shows photos from a correctly classified plot.

Figure 39. Views of plot 156 to the a) north, b) east, c) south, and d) west from the plot center

Narrative description: This vegetative community is dominated by shrub forms of oaks. The oaks occur in sparse to moderate densities, with less than 30 percent canopy cover. Individual oaks tend to be widely separated.

Elevation range and total area as mapped: The minimum mapped elevation of this vegetative community was 6,286 feet above sea level, and the maximum mapped elevation was 9,553 feet above sea level. The total area mapped for this vegetative community within the study area was 5,803 acres.

Ground-truth plot data: There were nine ground-truth plots in this vegetative community, and five of those ground-truth plots were partially or wholly correctly classified in the map. The data for plots are presented in Tables 38 and 39.

Table 38. Estimated Percent Canopy Cover of Tree Species (>10 feet tall) and Small Tree (<10 feet tall) and Shrub Species for Nine Sparse Oak Shrubland Ground-truth Plots*

	Number (%) of plots with the species	Percent of plots with cover <10 percent	Percent of plots with cover between 10 and 50 percent	Percent of plots with cover >50 percent
Tree Species				
Gambel oak	1 (11%)	11%		
Ponderosa pine	2 (22%)	22%		
Oneseed juniper	1 (11%)	11%		
Pinon pine	1 (11%)	11%		
Small Tree / Shrub Species				
Gambel oak	8 (89%)	11%	78%	
Wavyleaf oak	1 (11%)		11%	
Ponderosa pine	3 (33%)	22%	11%	
Oneseed juniper	2 (22%)	22%		
Apache plume	1 (11%)	11%		
Mountain mahogany	4 (44%)	33%	11%	
New Mexico locust	1 (11%)		11%	
Skunkbush sumac	1 (11%)	11%		
Pinon pine	1 (11%)	11%		
Yucca sp.	2 (22%)	22%		
Fendler's buckbrush	2 (22%)	11%	11%	

* Only the three most abundant species were recorded for trees and for small trees and shrubs in each plot. Blank spaces represent 0% cover.

Table 39. Estimated Percent Total Tree Canopy Cover and Ground Cover for Correctly Classified Sparse Oak Shrubland Ground-truth Plots, Field-verified Sparse Oak Shrubland Ground-truth Plots, and All Ground-truth Plots That Were at Least Partially Classified as Sparse Oak Shrubland

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Correctly classified plots (n = 5)							**No Data**	**20.0 (4.6)** (n = 5)
Cover <10%	20%	20%	40%	60%	40%	40%		
Cover 10% to 50%	80%	80%	60%	20%	20%	60%		
Cover >50%	0%	0%	0%	20%	40%	0%		
Field-verified sparse oak shrubland plots (n = 9)							**No Data**	**21.3 (5.6)** (n = 8)
Cover <10%	22%	11%	56%	56%	33%	56%		
Cover 10% to 50%	67%	67%	33%	33%	44%	44%		

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Cover >50%	11%	22%	11%	11%	22%	0%		
All plots at least partly classified as sparse oak shrubland (n = 14)							**10.3 (7.4)** (n = 3)	**30.0 (16.0)** (n = 8)
Cover <10%	43%	13%	36%	53%	36%	60%		
Cover 10% to 50%	57%	87%	57%	33%	29%	40%		
Cover >50%	0%	0%	7%	13%	36%	0%		

How ground-truth plots were classified: Figure 40 shows how the areas within the nine field-verified sparse oak shrubland ground-truth plots were classified in the current map.

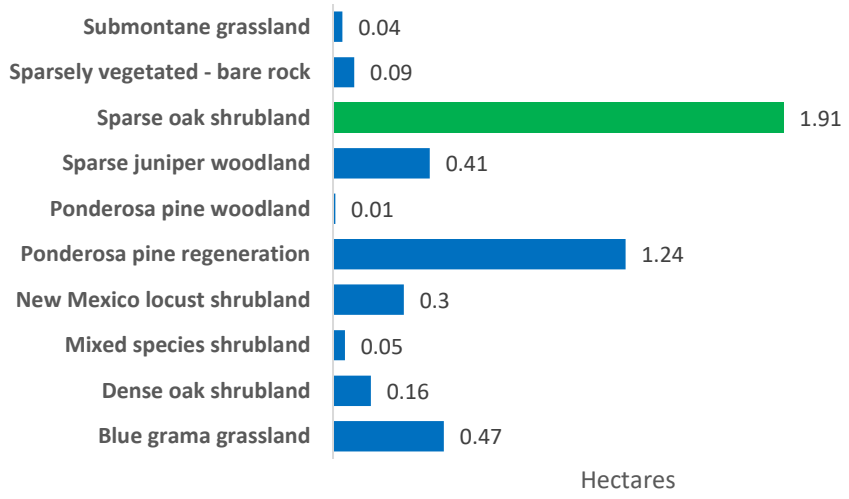

Figure 40. Map classifications of field-verified sparse oak shrubland ground-truth plots

Sparsely-Vegetated – Bare Rock

Figure 41 shows a photo from a correctly classified plot.

Figure 41. View looking west to plot 43

Narrative description: These areas have a primarily rock substrate and less than 20 percent total vegetation cover.

Elevation range and total area as mapped: The minimum mapped elevation of this cover type was 5,380 feet above sea level, and the maximum mapped elevation was 10,277 feet above sea level. The total area mapped for this cover type within the study area was 3,236 acres.

Ground-truth plot data: There were four ground-truth plots in this cover type, and all of those ground-truth plots were partially or wholly correctly classified in the map. The data for plots are presented in Tables 40 and 41.

Table 40. Estimated Percent Canopy Cover of Tree Species (>10 feet tall) and Small Tree (<10 feet tall) and Shrub Species for Four Sparsely Vegetated – Bare Rock Ground-truth Plots*

	Number (%) of plots with the species	Percent of plots with cover <10 percent	Percent of plots with cover between 10 and 50 percent	Percent of plots with cover >50 percent
Tree Species				
No trees recorded				
Small Tree / Shrub Species				
Apache plume	1 (25%)	25%		

* Only the three most abundant species were recorded for trees and for small trees and shrubs in each plot. Blank spaces represent 0% cover.

Table 41. Estimated Percent Total Tree Canopy Cover and Ground Cover for Correctly Classified and Field-verified Sparsely Vegetated – Bare Rock Ground-truth Plots, and All Ground-truth Plots That Were at Least Partially Classified as Sparsely Vegetated – Bare Rock

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Correctly classified and field-verified plots (n = 4)							**No Data**	**No Data**
Cover <10%	100%	100%	100%	100%	0%	100%		
Cover 10% to 50%	0%	0%	0%	0%	0%	0%		
Cover >50%	0%	0%	0%	0%	100%	0%		
All plots at least partly classified as sparsely-vegetated – bare rock (n = 12)							**25.6 (17.7)** (n = 5)	**18.5 (2.1)** (n = 2)
Cover <10%	83%	58%	67%	75%	17%	73%		
Cover 10% to 50%	17%	33%	33%	17%	25%	27%		
Cover >50%	0%	8%	0%	8%	58%	0%		

How ground-truth plots were classified: Figure 42 shows how the areas within the four field-verified sparsely-vegetated – bare rock ground-truth plots were classified in the current map.

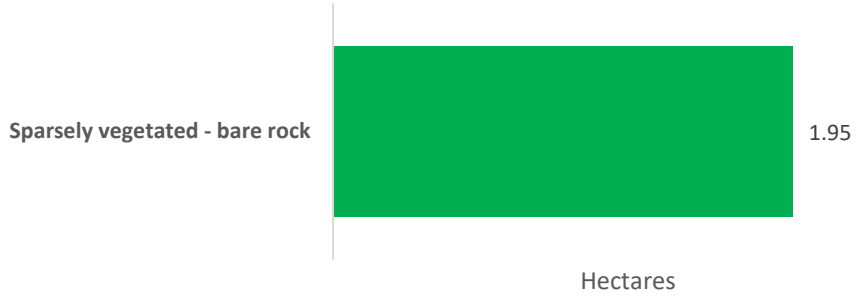

Figure 42. Map classifications of field-verified sparsely -vegetated bare rock ground-truth plots

Sparsely Vegetated – Bare Soil

Figure 43 shows photos from a correctly classified plot.

Figure 43. Views of plot 438 to the a) north, b) east, c) south, and d) west from the plot center

Narrative description: These areas have a primarily soil substrate and less than 20 percent total vegetation cover.

Elevation range and total area as mapped: The minimum mapped elevation of this cover type was 5,366 feet above sea level, and the maximum mapped elevation was 10,326 feet above sea level. The total area mapped for this cover type within the study area was 4,394 acres.

Ground-truth plot data: There were four ground-truth plots in this vegetative community, and two of those ground-truth plots were partially or wholly correctly classified in the map. The data for plots are presented in Tables 42 and 43.

Table 42. Estimated Percent Canopy Cover of Tree Species (>10 feet tall) and Small Tree (<10 feet tall) and Shrub Species for Four Sparsely-vegetated – Bare Soil Ground-truth Plots*

	Number (%) of plots with the species	Percent of plots with cover <10 percent	Percent of plots with cover between 10 and 50 percent	Percent of plots with cover >50 percent
Tree Species				
No trees recorded				
Small Tree / Shrub Species				
Chamisa sp.	1 (25%)	25%		

* Only the three most abundant species were recorded for trees and for small trees and shrubs in each plot. Blank spaces represent 0% cover.

Table 43. Estimated Percent Total Tree Canopy Cover and Ground Cover for Correctly Classified Sparsely Vegetated – Bare Soil Ground-truth Plots, Field-verified Sparsely-Vegetated – Bare Soil Ground-truth Plots, and All Ground-truth Plots That Were at Least Partially Classified as Sparsely-vegetated – Bare Soil

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Correctly classified plots (n = 2)							**No Data**	**No Data**
Cover <10%	50%	50%	100%	0%	50%	100%		
Cover 10% to 50%	50%	50%	0%	0%	50%	0%		
Cover >50%	0%	0%	0%	100%	0%	0%		
Field-verified sparsely-vegetated – bare soil plots (n = 4)							**No Data**	**No Data**
Cover <10%	75%	50%	75%	0%	75%	100%		
Cover 10% to 50%	25%	50%	25%	0%	25%	0%		
Cover >50%	0%	0%	0%	100%	0%	0%		
All plots at least partly classified as sparsely-vegetated – bare soil (n = 11)							**19.8 (27.7)** (n = 6)	**No Data**
Cover <10%	36%	27%	64%	27%	73%	90%		
Cover 10% to 50%	64%	73%	36%	9%	9%	10%		
Cover >50%	0%	0%	0%	64%	18%	0%		

How ground-truth plots were classified: Figure 44 shows how the areas within the four field-verified sparsely vegetated – bare soil ground-truth plots were classified in the current map.

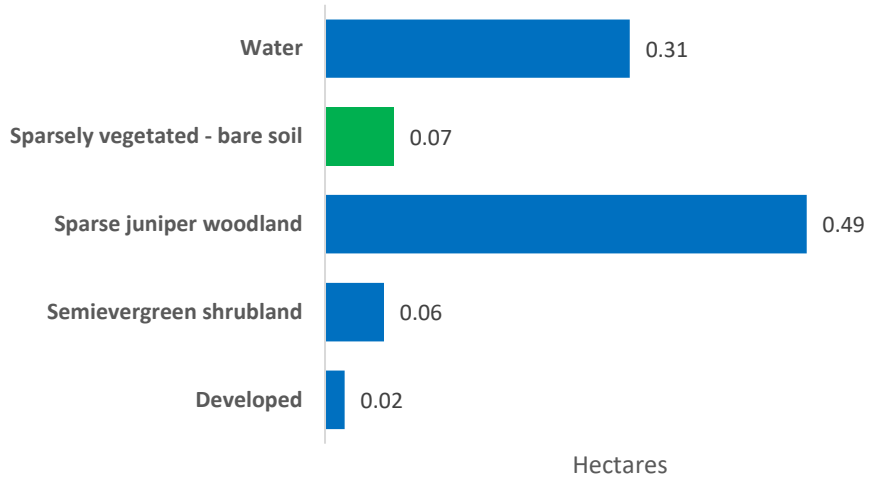

Figure 44. Map classifications of field-verified sparsely vegetated bare soil ground-truth plots

Submontane Grassland

Figure 45 shows photos from a correctly classified plot.

Figure 45. Views of plot 639 to the a) north, b) east, c) south, and d) west from the plot center

Narrative description: Submontane grasslands have a moderate to dense (10 to 80 percent cover) herbaceous layer that is dominated by grass species other than blue grama, and does not contain dense sod-forming bunchgrasses.

Elevation range and total area as mapped: The minimum mapped elevation of this vegetative community was 6,592 feet above sea level, and the maximum mapped elevation was 10,277 feet above sea level. The total area mapped for this vegetative community within the study area was 1,371 acres.

Ground-truth plot data: There were five ground-truth plots in this vegetative community, and four of those ground-truth plots were partially or wholly correctly classified in the map. The data for plots are presented in Tables 44 and 45.

Table 44. Estimated Percent Canopy Cover of Tree Species (>10 feet tall) and Small Tree (<10 feet tall) and Shrub Species for Five Submontane Grassland Ground-truth Plots*

	Number (%) of plots with the species	Percent of plots with cover <10 percent	Percent of plots with cover between 10 and 50 percent	Percent of plots with cover >50 percent
Tree Species				
Ponderosa pine	1 (20%)	20%		
Small Tree / Shrub Species				
Fourwing saltbush	1 (20%)	20%		
New Mexico locust	1 (20%)	20%		
Skunkbush sumac	1 (20%)	20%		
Chamisa sp.	1 (20%)	20%		
Gambel oak	2 (40%)	40%		
Oneseed juniper	2 (40%)	40%		
Ponderosa pine	1 (20%)	20%		
False Tarragon	1 (20%)		20%	

* Only the three most abundant species were recorded for trees and for small trees and shrubs in each plot. Blank spaces represent 0% cover.

Table 45. Estimated Percent Total Tree Canopy Cover and Ground Cover for Correctly Classified Submontane Grassland Ground-truth Plots, Field-verified Submontane Grassland Ground-truth Plots, and All Ground-truth Plots That Were at Least Partially Classified as Submontane Grassland

Plot category Cover category	Grass Cover	All Ground Vegetation	Litter Cover	Bare Soil	Rock Cover	Downed Wood	Percent Tree Canopy Cover (SD) (n)	Percent Shrub Canopy Cover (SD) (n)
Correctly classified plots (n = 4)							**1.0 (0.0)** (n =3)	**1.0 (0.0)** (n = 2)
Cover <10%	25%	0%	50%	0%	100%	75%		
Cover 10% to 50%	50%	25%	50%	100%	0%	25%		
Cover >50%	25%	75%	0%	0%	0%	0%		
Field-verified submontane grassland plots (n = 5)							**1.0 (0.0)** (n = 3)	**1.0 (0.0)** (n = 2)
Cover <10%	20%	0%	60%	20%	100%	80%		
Cover 10% to 50%	60%	40%	40%	80%	0%	20%		
Cover >50%	20%	60%	0%	0%	0%	0%		
All plots at least partly classified as submontane grassland (n =13)							**10.4 (11.9)** (n = 8)	**12.4 (17.2)** (n = 7)
Cover <10%	8%	0%	38%	38%	85%	85%		
Cover 10% to 50%	62%	23%	54%	62%	15%	15%		
Cover >50%	31%	77%	8%	0%	0%	0%		

How ground-truth plots were classified: Figure 46 shows how the areas within the five field-verified submontane grassland ground-truth plots were classified in the current map.

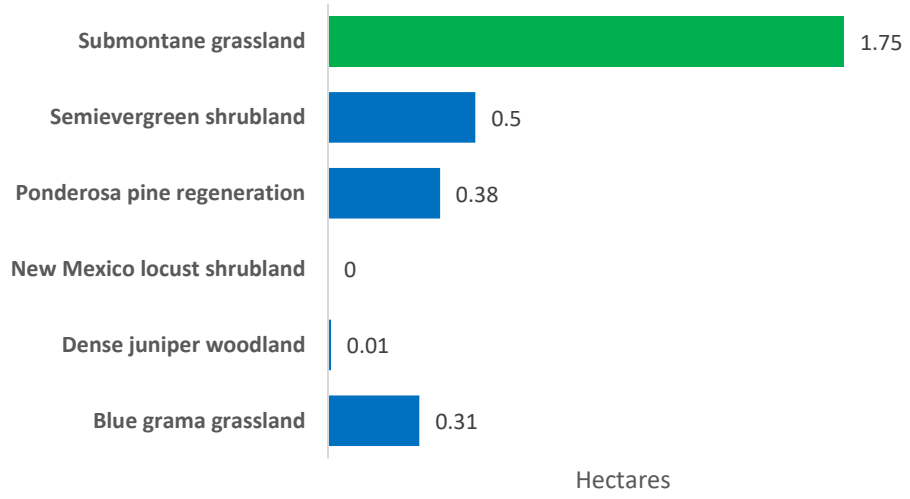

Figure 46. Map classifications of field-verified submontane grassland ground-truth plots

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Ortho-rectification of Satellite Imagery: Joel Rowland

APPENDIX 1: GROUND-TRUTH PLOT DATA SHEET

Date ____ / ____ / ____ Site ID _____
MM DD YY

Field Team: _____

GPS Unit & File Name: _____

or Coordinates: N _____ E _____

Camera ID and photo file names: _____

Location Notes: _____

Trees (> 10 feet tall)

Species	Percent Cover (circle one)		
	<10%	10 - 50	>50
	<10%	10 - 50	>50
	<10%	10 - 50	>50
	<10%	10 - 50	>50
	<10%	10 - 50	>50
	<10%	10 - 50	>50
Snags (dead trees)	<10%	10 - 50	>50
Total tree cover	<10%	10 - 50	>50

GIS Total tree cover _____

Shrubs & Young Trees (< 10 feet tall)

Species	Percent Cover (circle one)		
	<10%	10 - 50	>50
	<10%	10 - 50	>50
	<10%	10 - 50	>50
	<10%	10 - 50	>50
	<10%	10 - 50	>50
	<10%	10 - 50	>50
	<10%	10 - 50	>50
Total shrub cover	<10%	10 - 50	>50

GIS shrub spp 1 cover _____

Ground Cover (grasses, forbs, other)

Species	Percent Cover (circle one)		
Grass spp.	<10%	10 - 50	>50
Total veg cover	<10%	10 - 50	>50
Litter	<10%	10 - 50	>50
Bare Soil	<10%	10 - 50	>50
Rock	<10%	10 - 50	>50
Downed wood	<10%	10 - 50	>50

Instructions

*Use four letter acronyms for plants

*All cover estimates are absolute cover, not relative cover

*Use cover estimation techniques if not sure (densiometer, point-intercept transects)

*Take site photos as described in procedure

Veg Class: _____

Notes: _____

APPENDIX 2: COMMON AND SCIENTIFIC NAMES OF PLANTS*

Common Name	Scientific Name
American red raspberry	*Rubus idaeus*
Apache plume	*Fallugia paradoxa*
Big sagebrush	*Artemisia tridentata*
Box elder	*Acer negundo*
Cattail sp.	An unidentified species of the genus *Typha*
Chamisa sp.	An unidentified species of the genus *Ericameria*
Chokecherry	*Prunus virginiana*
Coyote willow	*Salix exigua*
Douglas-fir	*Pseuedotsuga menziesii*
False Tarragon	*Artemisia dracunculus*
Fendler's buckbrush	*Ceanothus fendleri*
Fivepetal cliffbush	*Jamesia americana*
Fourwing saltbush	*Atriplex canescens*
Fringed sage	*Artemisia frigida*
Gambel oak	*Quercus gambelii*
Gooseberry sp.	An unidentified species of the genus *Ribes*
Limber pine	*Pinus flexilis*
Mountain mahogany	*Cercocarpus montanus*
Narrowleaf cottonwood	*Populus angustifolia*
New Mexico locust	*Robinia neomexicana*
New Mexico olive	*Forestiera pubescens*
Oceanspray	*Holodiscus dumosusiscolor*
Oneseed juniper	*Juniperus monosperma*
Piñon pine	*Pinus edulis*
Ponderosa pine	*Pinus ponderosa*
Quaking aspen	*Populus tremuloides*
Reed canarygrass	*Phalaris arundinacea*
Rio Grande cottonwood	*Populus deltoides*
Rocky Mountain juniper	*Juniperus scopulorum*
Rocky Mountain maple	*Acer glabrum*
Russian olive	*Elaeagnus angustifolia*
Saltcedar	*Tamarix ramosissima*
Sand sage	*Artemisia filifolia*
Skunkbush sumac	*Rhus trilobata*
Snakeweed	*Gutierrezia sarothrae*
Water birch	*Betula occidentalisnigra*
Wavyleaf oak	*Quercus ×pauciloba*
White fir	*Abies concolor*
Willow sp.	An unidentified species of the genus *Salix*
Winterfat	*Krascheninnikovia lanata*
Woods' rose	*Rosa woodsii*
Yucca sp.	An unidentified species of the genus *Yucca*

* Plant common and scientific names are from USDA, NRCS (2018).